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COBBY CHAT LASSIE

THE MODEL ENGINEER

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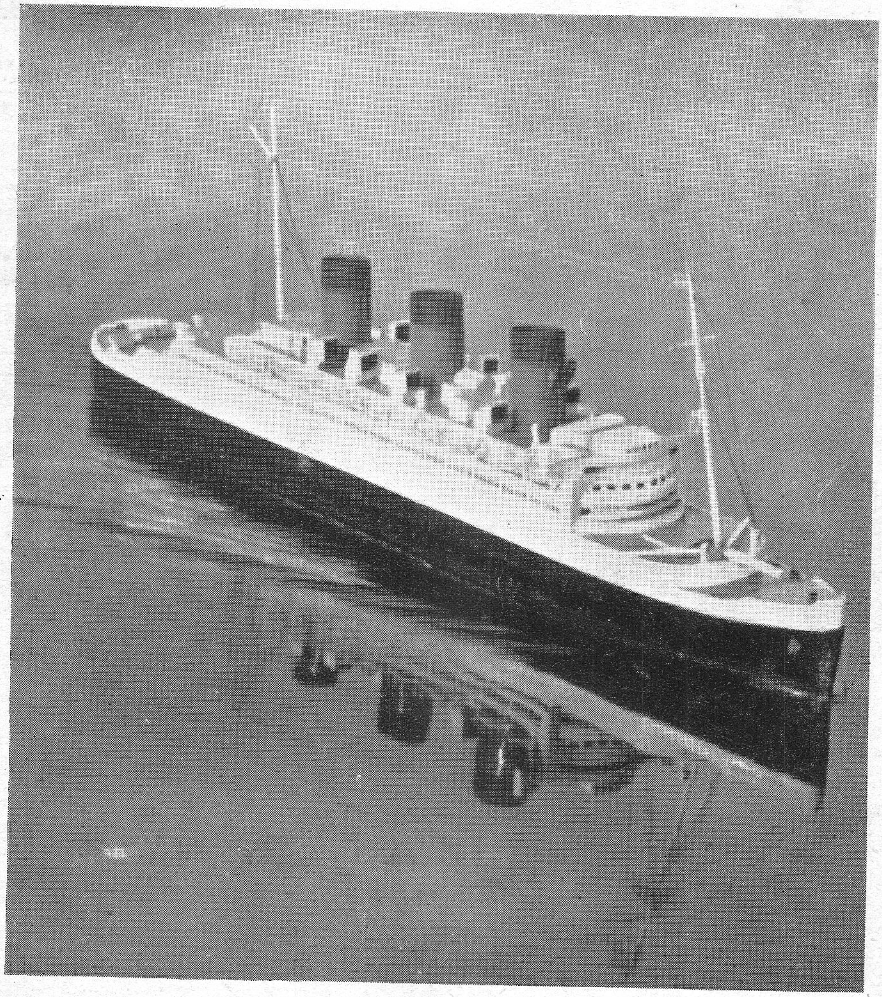

A model of the "Queen Mary" sailing on Highgate Pond. She is the work of Mr. Sidney A. G. Silk and is powered by two double-acting single-cylinder steam engines. The hull is of tin-plate built over a previous hull made of papier mâché which, however, was not a success

THE MODEL ENGINEER

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March 14th, 1946

Smoke Rings

A Traction Engine Dream

A SERVICE reader overseas writes me :—"Of the past six years, four have been spent overseas, and many weary and difficult moments have been passed in dreaming of the traction engine which one day, under happier circumstances, I would construct. Now, with the prospect of being released from military service in April, it seems that soon I shall be in a position to turn my dreams of the traction engine into reality. Except for one thing, and in this, perhaps, you can help me." My correspondent's ambition is to build a fully-detailed engine of the showman's type, to a scale of $1\frac{1}{2}$ in. or 2 in., and the one thing he lacks is a set of working drawings. He says :—"I lack the necessary knowledge to make my own drawings—there are no traction engines near my home in England from which I might make even rough sketches, and a recent advertisement in THE MODEL ENGINEER has been unfruitful. If you can obtain the necessary drawings, the construction of the engine will be a tremendous help towards that difficult process of rehabilitation in civilian life which all we servicemen are fearing." I know that several of my readers have built excellent engines of this type and size, and if one of them would care to lend or sell drawings to my correspondent I shall be pleased to forward any helpful offer. Actual drawings should not be sent till he returns home.

Electric Traction

A LETTER in our correspondence columns from Mr. F. L. Gill-Knight, puts the case for greater interest among model engineers in the subject of electric traction. The electric locomotive should not be regarded as a rival of the steam locomotive in the eyes of the model maker. It possesses problems and interests of its own, and is in no sense a competitor for public favour on the track in the point of efficiency or passenger-hauling capacity. On the main line railways, where electric locomotives are achieving considerable success, conditions of economy and convenience in operation are matters of real moment, and electricity does enter into direct competition with steam. For the model engineer, however, the question is rather one of technical interest, and it opens up a special range of problems for solution. Not the least of these is the supply of current to the motor. The collection of current from an overhead conductor, while perfectly feasible on the real railway, is not such a simple matter on the garden passenger-carrying track, where overhead clearance is a necessary and important provision. Mr. Gill-Knight, however, states a good case for model electric traction, and he tells me that he knows of at least two $3\frac{1}{2}$-in. gauge locomotives which are in production. We shall hope to hear more about them, and, perhaps, about some others of a similar character which his appeal may bring to light.

The Science Museum

AS we have already announced, the Science Museum has once again opened its doors to the public. Only about one-third of the Museum is yet in use, but the other sections will be re-opened in due course, and model engineers will be able to wander through the fascinating galleries and study the exhibits to their heart's content. The Museum is opening on a very topical note, for there is a fine display of German aero-engines, and what is, perhaps, of greater interest, two standard British jet engines, the Rolls Royce "Derwent" and the de Havilland "Goblin." It is good, however, to know that the fine locomotive collection and the always popular children's gallery, are once again on view.

The Royal Horticultural Society

I AM sorry to hear, that for reasons of ill-health, Col. Frank R. Durham has felt obliged to resign the secretaryship of the Royal Horticultural Society, a position he has occupied with much distinction and success for many years past. I first knew Col. Durham in the days when we were both active members of the Junior Institution of Engineers, and when THE MODEL ENGINEER began its long series of Exhibitions at the Royal Horticultural Hall, I was more than pleased to find him in responsible charge of the building, in addition to his many other secretarial duties. As an engineer he always took a keen personal interest in our exhibitions, and in many little ways was able to add to the comfort of our arrangements. His successor in office is Brig. C. V. L. Lycett, who will be an equally welcome visitor.

Percival Marshall

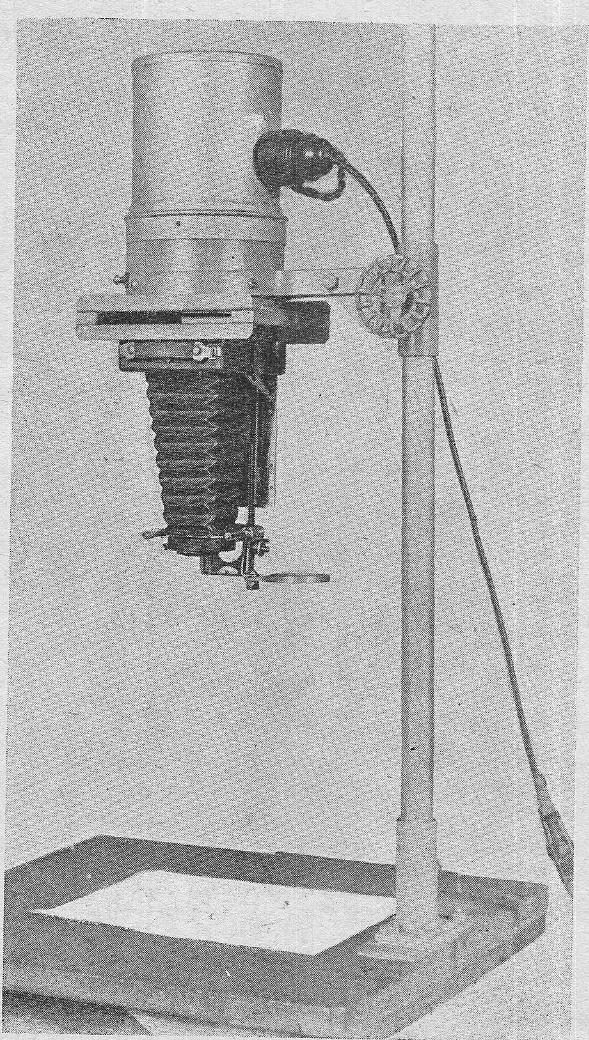
As there are only four screws holding the condenser housing to the top plate *A*, fresh holes, 3/32 in. diameter, were drilled in between the discarded holes through the flange on *C* and top plate *A*. These were countersunk on the underside of the plate *A*, and flange of *C* riveted to plate *A* with 3/32-in. rivets, any projections being carefully filed off to a neat finish.

The condenser in its mount was tried in the housing, and three equidistant holes were drilled in housing *C*, halfway up the thickness of condenser. These holes were fitted with $\frac{3}{16}$-in. Whitworth set-screws with one nut inside the housing and one out. These were adjusted later to keep the condenser centrally in place, but so it could be taken out easily for cleaning, etc.

The lamp-house, *D*, was made from sheet-steel to the dimensions shown; the reason this was made in two portions was because the head-lamp mask was fitted with a cap holding a plain glass to keep out the weather, etc. This came in handy, as it was a nice fit on *C*, and so the top portion was added by welding on.

As many readers will probably get only the usual mask without this refinement, they will have to make the whole of the lamp-house, so it can be made in one piece, excepting the top, and should be just a nice easy push-on fit on *C*.

If it is made in one piece, something will have to be done to make sure that, when it is put on, it goes on to the same position each time; so some small stops should be fixed at the $\frac{7}{8}$-in. position inside, to prevent it being pushed on too far. The top, in my case, is just flanged over (as per boiler making) and is just a push-on fit.



The complete enlarger

Although welding has been mentioned for the lamphouse, there is no reason why the whole thing should not be soft-soldered.

An oval slot was cut in the side of lamp-house to insert the lamp-holder, and this was $1\frac{1}{2}$ in. long by $\frac{3}{4}$ in. wide, but I will refer to this later.

When this enlarger was made I found it impossible to get any bulbs, except those with the filament down the centre, and that with the lamp-holder in the usual position, *i.e.* in the centre of top of lamp-house, the filament support cast a shadow, which defied all my efforts to dispose of; so, eventually, it was tried in the position shown in the photographs, by means of the special fitting shown in Fig. 2. This enabled both sorts of lamp to be used, either straight or "V" filament.

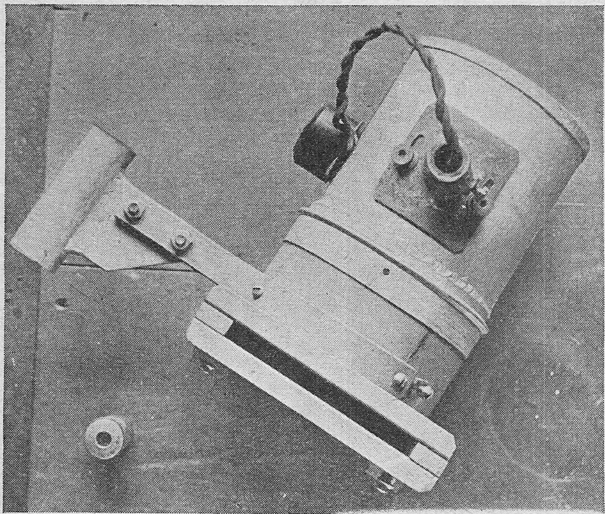
This fitting was made by bending a plate of $\frac{1}{16}$-in. thick mild-steel to the curvature of the outside of lamp-house (see *E*, Fig. 2) in the centre of which was bored a $\frac{7}{8}$-in. hole. In this hole was fitted a length of tubing, *F*, with a $\frac{3}{4}$-in. bore, which was brazed in position, a small lug being also brazed on to take the small clamping-screw shown. Two slots were also cut out and filed up $\frac{7}{8}$ in. long and $\frac{3}{16}$ in. wide, in the positions shown, to take up the fixing screws, and to facilitate focussing.

Sliding in the aforementioned tubing is another piece, *G*, $\frac{3}{4}$-in. outside diameter and $2\frac{1}{2}$ in. long, the inner end being bored to take a lamp-holder *H*, taken from a motor head-lamp (double - pole); this lamp-holder was made just a tight push-fit. On the outer end of this tubing is soldered a knurled ring, *I*, for ease of manipulation.

Referring to the oval slot in the side of lamp-house; in my case, the centre of this slot is $2\frac{3}{4}$ in. from the bottom

This may seem a crude arrangement, but as the screws take up a radial position when inserted, they cannot be fixed, or the lamp-holder fitting could not be threaded on; but if the terminals (which came off sparking-plugs) are made an easy fit on the set-screws, they will give no trouble from turning.

The camera fits on the underside of the bottom plate *A*, and the clips which hold it in position, and also the angle framework which surround it, can be seen in the appropriate photograph, and is also shown in the section, Fig. 3, the angle-strips being shown by *X*.



View showing lamp-holder fitting

This angle-frame was made from "Juneero" angle-strip, which can be bought in packets separate from the outfit, and is about ⅜ in. × ⅜ in. × 1/32 in. thick, and is very useful for many purposes.

The frame has not been shown in the drawings, as cameras are apt to vary in size, and the frames will have to be made to suit. Don't make it too tight a fit, and keep the framework central and square with the negative-opening.

It was riveted on in position with 3/32-in. rivets, the top side of the holes in bottom plate *A* being countersunk, and any projection from the rivets being carefully filed off.

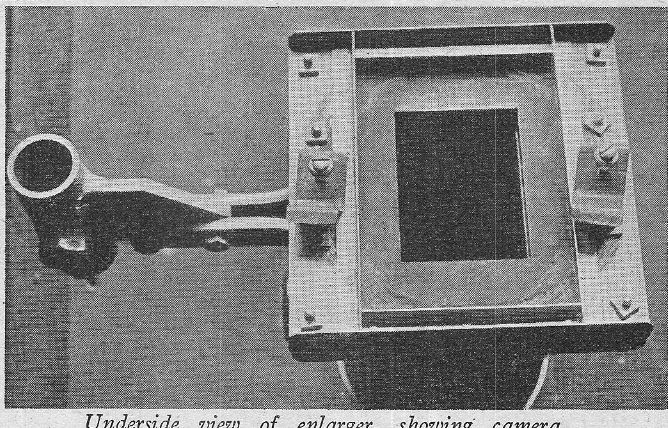
The clips holding the camera were designed after some thought, have been very satisfactory, and are shown in section, Fig. 3.

These clips were made from about 1/32-in. thick steel, and are kept in place by means of a 2-B.A. set-screw and terminal, and it is only necessary to run back the terminal a few turns to remove the camera. Again, no sizes have been given, as conditions will vary, but everything should be made clear from the photographs and drawings.

The column supporting the enlarger was made from a scrap lorry steering-column, and is stout steel tubing, 1 in. in diameter, and nicely true and smooth on the outside. These can sometimes be obtained from scrap dealers or repairers, as they are generally scrapped because the worm attached is either worn out or badly chipped; the one in my case was cut off to 38 in. long.

The enlarger supporting bracket, Fig. 4, was made from a piece of stout steel tubing, bored out a nice fit for the column, and a piece of ¼-in. thick mild-steel plate cut out to the dimensions shown and welded on. A small lug was also welded on to take the ⅜-in. B.S.F. fixing-screw to which was attached a hand-wheel which originally did duty on a wheel-valve, and can be seen in the photographs.

The enlarger is attached to this bracket by means of two other brackets, bent up from ¾-in. × 3/16-in. flat mild-steel, which enclose the condenser-housing for about two-thirds of its circumference and being secured to it by 3/16-in. set-screws and nuts. The other ends of these brackets are bolted on to piece *L*, Fig. 4, by means of two ¼-in. bolts and nuts.



Underside view of enlarger, showing camera clips and frame

These brackets have not been shown in the drawings, as I think they will be quite clear from the photographs. In my case, the centre of the camera lens is about 7 in. from the column.

The column supporting bracket, Fig. 5, was welded-up similarly to Fig. 4, and was made from a similar piece of tubing with a piece of ¼-in. thick mild-steel for base-plate, and not forgetting the small lug for the fixing-screw.

(*Continued on page* 264)

in all cases, the general form of construction was more or less similar to that shown in Fig. 73, which represents the latest step so far made in the development of this form of design.

The design and construction of the rotor used in these magnetos was substantially the same as that of the "Atomag Minor," and the same applies to the coil windings; the reason for this was not only because components were already available, but also because they facilitated comparison of efficiency with standards already set up. It is quite possible that a specialised form of design in these components, to suit the particular arrangement of the machine, might be found to give better results; but this line of development has not, so far, been touched.

In the design illustrated, the stator and coil are enclosed inside a casing machined from aluminium alloy tube, $1\frac{7}{8}$ in. outside diameter by $1\frac{13}{16}$ in. long, having the ends machined dead square with the bore, to form a register for the bearing housing and the cover-plate, which of the grain, relative to the flow of the magnetic flux, would be all wrong, and would involve a "cross-grain" junction with the core of the coil.

In case the sectional side and end elevations of the magneto are found inadequate to illustrate the stator arrangement properly, an isometric view of the stator and coil assembly is shown in Fig. 74. The angular length of the pole shoes is the same as for the normal type of two-pole magneto, that is, approximately 100 degrees, and their extensions or "limbs" are narrowed down to the width of the core. It will be noted that the cross-section of the core is a good deal more than that of the stator limbs at this point, which may not be good electrical design, but this is simply because the core and coil windings were identical with those of the "Atomag Minor," for purposes of comparison; it would have been more consistent to have made the core the same cross-section as the stator limbs, and solid instead of laminated.

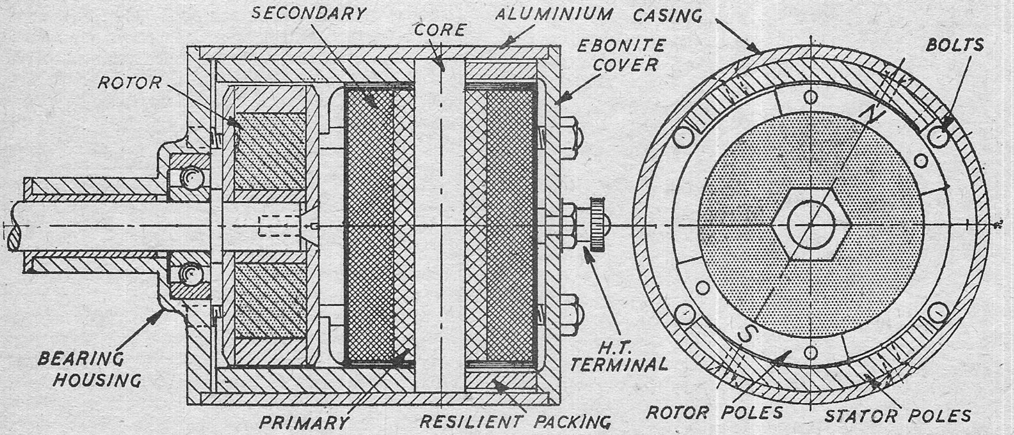


Fig. 73. Sectional side and end elevations of barrel type miniature magneto. (Full size)

are secured by four long 6-B.A. brass studs passing right through the casing, just clear of the pole-pieces, in similar manner to the form of assembly very commonly used in electric motors. The bearing housing is essentially similar to that of the "Atomag Minor," but in this particular magneto, no contact-breaker is incorporated in the machine itself, as a separate breaker was used for testing. Similarly, no special provision for mounting the magneto is shown, but it is obviously suitable for concentric mounting, and may be secured either by clamping over the spigot of the housing or the outside of the casing, or by bolting through the flange of the housing, which may be widened or equipped with lugs for this purpose.

The stator pole shoes are secured inside the outer casing, each by two countersunk screws (shown dotted in the end view) which pass radially through the pole-pieces and are machined off flush with the inside of the rotor tunnel face. It has been found of little advantage to attempt to laminate these shoes, though this might be done by making them of concentric layers of thin sheet-iron; but the fact is that the direction

As the coil is completely enclosed in the metal casing, there is no need to enclose it in a paxolin tube; it is therefore taped on the outside, and the end of the secondary is led out to a metal foil tag, which, when the magneto is assembled, makes contact with the h.t. terminal in the centre of the cover. This cover is made of insulating material, but a metal cover with a fairly large central insulator could also be used. The primary lead to the contact-breaker and condenser is also taken out through the cover, at a point well remote from the h.t. terminal, that is, near the outer edge. To keep the core of the coil pressed into close contact with the limbs of the stator, two packing pieces of semi-hard rubber are interposed between the ends of the core and the cover plate. An alternative method would be to use solid packing blocks with set-screws fitted to the cover, and adjusted to bear on them after the latter has been secured by its studs and nuts.

One slight modification in the rotor design, as compared with that of the "Atomag Minor," may be noted; that is the use of a countersunk screw in the end of the shaft, to retain the rotor

*Railway Interlocking Frames

By O. S. NOCK. B.Sc., A.M.I.Mech.E., M.I.R.S.E.

No. 2. THE STEVENS APPARATUS—Part II

WE have next to consider the arrangements for pivoting the levers. Fig. 5 shows an elevation of the frame including one standard and levers on either side of it. Each lever is carried on a short length of shaft, $1\frac{1}{8}$ in diameter. These shafts vary in length according to their position, for a purpose that will be explained later. Between the standards the shafts are carried in a base casting, as illustrated in Fig. 6; the shaft rests in a trough in Fig. 5, and these shafts are made only 4 in. long. Before one of the levers adjacent to a standard can be removed from the frame the shaft must be withdrawn from the hole in the boss; to do this without disturbing any other lever a short length of shaft, 1 in. long, is inserted at F (Fig. 5). This can be lifted out when the cover-plate has been taken off, and the space thus made available is used for sliding the shaft clear of the boss in the standard.

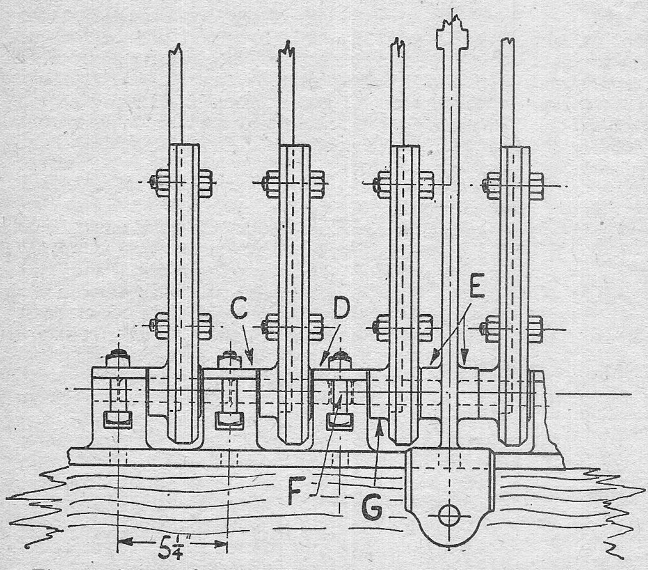


Fig. 5. Stevens frame. Elevation showing mounting of levers

Fig. 5 also shows a front elevation of the cast-iron lever shoe; this was shown in side elevation in Fig. 1, in Part 1 of this article. The shoe has a general thickness of $1\frac{1}{2}$ in., with channels $\frac{5}{8}$ in. deep, cast in to fit the lever and the lever tail. The boss shown at G (Fig. 5) extends to make an overall width of $2\frac{1}{2}$ in., so allowing a suitable amount of end-play between the guides of the base casting, Fig. 6.

Lastly, we come to the interlocking itself; but before describing the detailed application on the Stevens frame, the actual principle of tappet locking requires some explanation. In Fig. 7, tappets relating to three levers, 1, 2 and 3, are shown. These tappets slide through grooves in the sides of the locking trough, in the direction indicated by the arrows. The locking dogs lie in the trough and are riveted to a bridle, or lock-bar that passes over the top of the tappets. An iron cover, that is open at the top, and is stopped from rising by a plate $\frac{1}{2}$ in. thick, secured in turn by $\frac{1}{2}$-in. bolts engaging in a slotted groove in the base casting. So to remove a lever all that is necessary is to take off the cover-plate on either side, as at C and D, in Fig. 5, and the lever, with its shaft can be lifted out. In the case of the intermediate levers, the pieces of shaft are $5\frac{1}{4}$ in. long, that is equal to the pitch of the levers. At the standards, however, there is no cover-plate to be removed; the shafts on either side fit into blind holes on each side of the boss E,

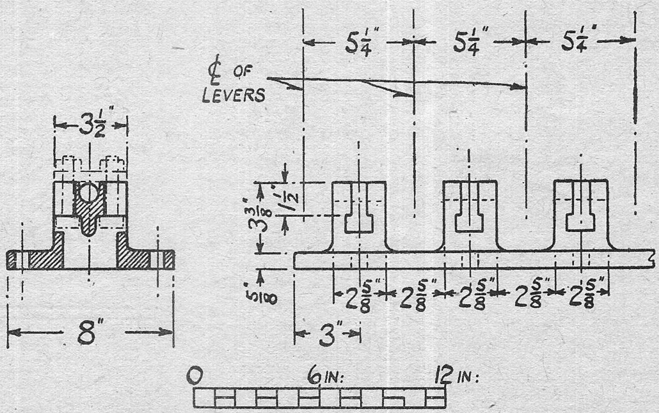


Fig. 6. Stevens frame. Base casting

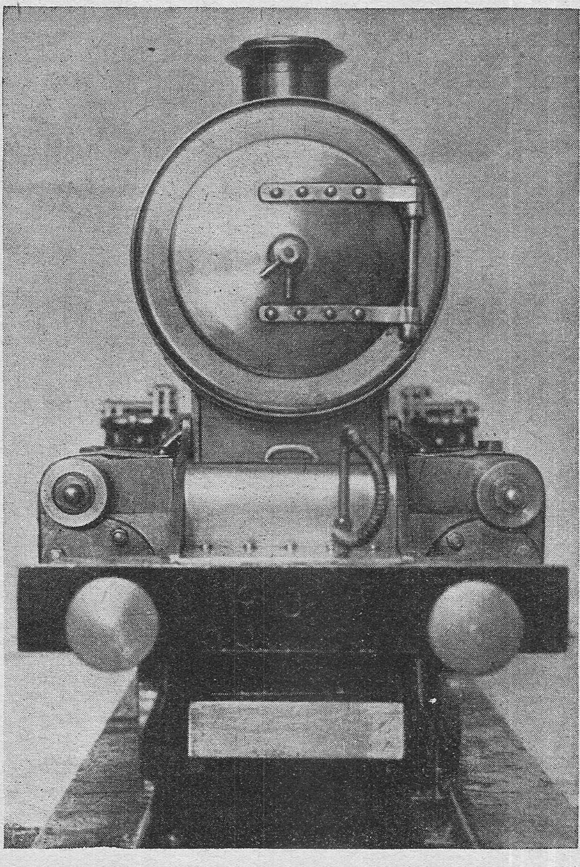
* *Continued from page 237, "M.E." March 7, 1946.*

A Lobby Chat About "Hielan' Lassie"

By "L.B.S.C."

JUST as anticipated, the advent of "Curly's Galloping Sausage," as somebody facetiously nicknamed it, has brought plenty of correspondence, queries and suggestions; so, in order to save ink, paper, and undue exercise of grey matter on the part of the querists, both present and prospective, and your humble servant, let us have a little lobby chat about some of the contents of the various letters. First of all, that casual remark made in the introduction, that if I built one of the engines myself, I should fit Baker valve-gear, has provoked a good many echoes; one reader says "If old Curly prefers Baker gear, that's good enough for me, so Baker it is, and what about giving the 'gen' on it as an alternative?" All right, anything to oblige, so if all goes well I will give the words and music so that those who wish, can sing the song with a different chorus. As a matter of fact, the use of Baker gear cuts out several tight spots in the erection, because the gear frame can be erected in the most convenient position, irrespective of height within reasonable limits. The angle of the rod joining the bottom of the bell crank to the combination lever, operates just as well at a slight angle, as it does if exactly horizontal. There is no need for the knee-joint on the valve-spindle; and as the Baker reverse shaft can be placed between the second and third coupled wheels, and connected to the yokes by overhead reach rods, the "squeeze" of the Walschaerts reverse shaft is completely eliminated.

There is one point in the application of Baker gear, that I can't definitely decide until I have had a chance to go more fully into details, and that is the arrangement for the inside cylinder. By exercising my priceless gift of "visualisation" I see that the ordinary gear assembly is going to foul the bottom of the boiler, and a whacking great eccentric is required for imparting the necessary waggle to the bottom of the gear connecting-rod. It seems to me that this is one of the occasions when a conjugated gear can be effectively employed; the cylinders and steam-chests being in the same plane, or as near as makes no practical odds, it only needs the Gresley two-to-one levers, or alternatively Mr. Holcroft's three-cylinder arrangement. There is plenty of room for either of these, and the valve-setting would be all right with the crank set as I have described in the previous instalments. Anyway, I will do my best to scheme out the simplest and most workable arrangement without sacrificing any efficiency. No alteration will be needed to the cylinders or any other part of the engine, except, perhaps, to bring the valve-spindles through the front of the steam-chests, same as on "Tugboat Annie."



A good-looking front end—note double reverse-yokes of Baker gear

Alternative Chimney and Dome

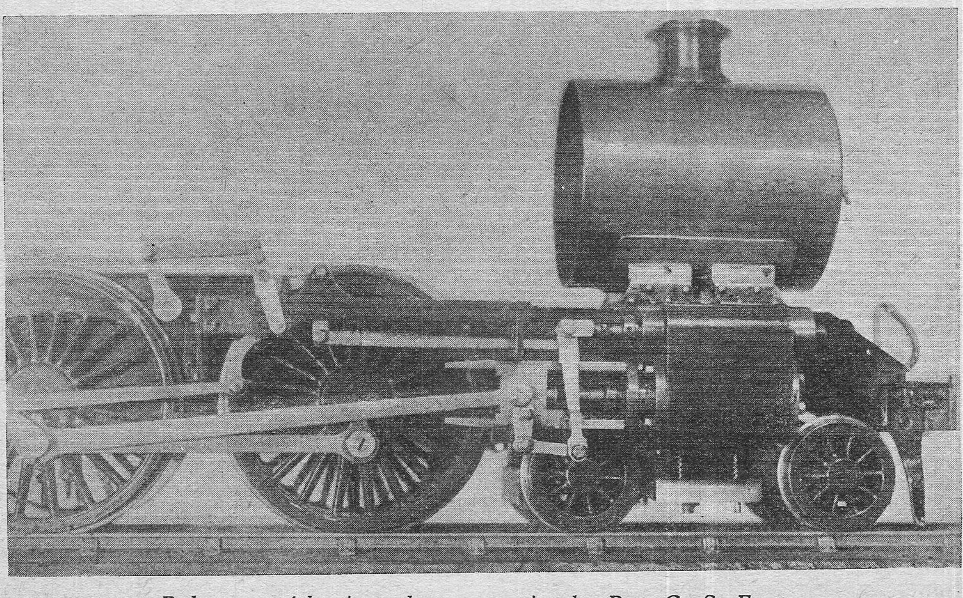
Some readers who dislike the look of the double chimney and the "streamline" dome casing, want to know if the older type of chimney fitted to the "A1" and "A3" Pacifics can be used. Well, it isn't my fault that the personal appearance of the components mentioned, doesn't compare with Apollo, Venus, or Cleopatra; blame the L.N.E.R. locomotive department for that—I've only shown what is their latest prac-

gauge curves could be assured by giving the trailing axle $\frac{3}{16}$ in. side movement in ordinary outside axleboxes. For the same reason, a double bogie-tender would be preferable to the rigid one in this size also.

Some Lassie!

Finally, we have some stalwart members of the unofficial brotherhood of locomotive builders who want to build "Hielan' Lassie" to 5-in. gauge. There are four of them in a bunch at Blackburn, for instance, and evidently mean business, as they have already tackled 5-in. gauge "Princess Royals"—maybe they want to stage an L.M.S. *v.* L.N.E. competition! Well, I am rather afraid the drawings and instructions for the $3\frac{1}{2}$-in. gauge engine are not going to be a great deal of use for a 5-in. gauge job, over one-twelfth full size; for in an engine of that size, weight and power, it would be better to copy full-size practice. For example, the cylinders should be cast-iron with ringed pistons, $1\frac{5}{8}$-in. bore and $2\frac{1}{4}$-in. stroke, with $\frac{3}{4}$-in. piston-valves having rings on the bobbins. The valve-gear should be a reduced copy of the gear on the full-sized engine, with cross-sections of rods and pins a little larger than "scale," in order to give long life. The frames should be 5/32-in. in thickness at least, and $\frac{3}{16}$-in. steel-plate could be used with advantage, the whole doings being welded or Sifbronzed, to save a lot of very heavy riveting work. The same type of bogie springing as given for $3\frac{1}{2}$-in. gauge, could be used, as this *is* a copy of full size, also the trailing radial boxes, but working leaf springs should be used where they are found on the full-sized engine. No pump would be needed between frames, as two injectors (my improved "Vic" type) would attend to the boiler-feed. Wheel sizes should be, bogie $3\frac{1}{4}$ in., coupled $6\frac{3}{4}$ in., trailing $3\frac{3}{4}$ in., the latter having radial axleboxes. The coupled axleboxes should be in two pieces, with hollow keeps containing lubricating-pads; but no wedges need be used in the bronze horn-blocks, as they are now being dispensed with in some types of full-sized engines.

The boiler would be a hefty job, and I don't think it could be managed single-handed. The type I am specifying in due course for the $3\frac{1}{2}$-in. gauge engine, could be used, as it is a faster steamer than a strict copy of the full-size boiler would be; but it would, of course, need a different tube arrangement, also different staying, and if all goes well I will get out a sketch, same as was shown for the G.W. "1000" class boiler, with a few notes. It would have to be made from $\frac{1}{8}$-in. copper, with $\frac{3}{16}$-in. backhead, and would be rather expensive; but where this would be a drawback, an all-welded steel boiler, galvanised inside and out like a domestic hot-water tank, would be satisfactory and much cheaper. An all-riveted one would also serve, provided that the riveting was done in the proper manner, and the galvanising process would seal up any interstices in the seams, stopping the leaks before they started, as our Hibernian chum would put it. I wouldn't recommend an untreated steel boiler, on account of rust and corrosion, having dissected a few specimens just for curiosity's sake. Incidentally, some of our uninitiated friends still run away with the idea that a steel shell and copper firebox will give the same results on a little engine, as on a big one. Well, it just won't, for once again the fact that you can't "scale" Nature, puts the signal up. Creeping, pitting, and electrolytic action would all take place in the little boiler, just the same as in the big one, with this difference *—that the pits, amount of corrosion, and electrolytic wastage are constant, whatever the size of the boiler.* To put it in plain language, if a pit $\frac{1}{8}$ in. diameter and $\frac{1}{16}$ in. deep, formed in a



Baker-gear Atlantic under construction by Rev. G. S. Froggatt

Fine Feed for a 3-in. Lathe

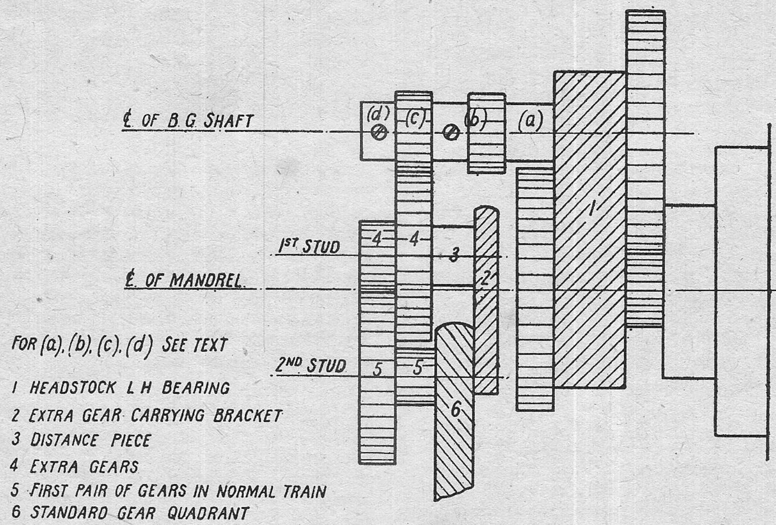
By W. T. L. SLOAN

THE desirability of a fine feed for small lathe work has been frequently stressed in this journal, and some interesting devices have been described from time to time. On the present occasion the writer takes the liberty of offering yet another suggestion for three reasons, *viz.* :— extreme simplicity, efficiency, and as far as he can recall, novelty.

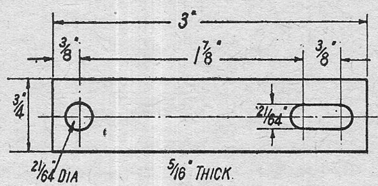
The lathe in question is a 3-in. Grayson, but the idea described below is capable of adaptation to suit different sizes and makes of machine. Briefly, it lies in making use of the back-gear as the beginning of the feed gear train, instead of the usual gear on the mandrel. It should, perhaps, be mentioned that the back-gear arrangement is the common one of the two pairs of gears next to and on opposite sides of the left-hand headstock bearing.

The actual modifications required are as follow : The existing back-gear shaft must be removed, and a new one fitted, of such a length as to bring its end level with the tail end of the mandrel—in this instance, $4\frac{1}{4}$ in. instead of the original $2\frac{1}{2}$ in. It may be argued that this leaves an excessive overhang, from the end of which the drive is taken ; but, owing to the great reduction, the power developed at the lead screw is very great for a comparatively light load on the gears at this point, and no trouble has been experienced.

Since the back-gear shaft revolves in the opposite direction to that of the mandrel, an extra gear must be introduced between the back-gear shaft and the first gear of the normal feed train, in order to maintain the usual direction of rotation of the lead screw, i.e. feeding the saddle towards the headstock. This gear may be either an idler, or for very fine feeds, a driven and a driver, as indicated in the diagram. These are carried by the simple extension bracket shown. It is secured to the right-hand side of the standard gear quadrant by the stud and nut which carry the first pair of gears of the normal train. In the slot of this bracket the stud for the extra pair of gears is secured, and they are positioned in line with the others by a distance-piece. This new stud is the same as the standard ones, but longer by the length of the distance-piece.



Finally, a word about the gears on the extended back-gear shaft. This carries, when set for single gear work, and reading from right to left : (a) a distance-piece, to keep the small back-gear driver clear of the driven gear on the mandrel ; (b) the back-gear driver and its collar, to which it is riveted ; (c) the first small driver of the feed-gear train, and (d) its driving collar.



Mild-steel bracket

In operation, of course, the back-gear is engaged with the mandrel driver in the usual way. It will be seen that, in order to use the back gear as such, all that is necessary is to reverse the positions of the distance-piece (a), and the back-gear driver (b).

(Continued on next page)

Memories of Exhibition Models

THE idea of a Great Exhibition, to be held in London, in 1951, has set me pondering on the subject of the many interesting models, particularly railway models, I have seen in the course of my lifetime at sundry exhibitions.

One of my earliest memories is of the Franco-British exhibition, at Shepherd's Bush, in 1908, when the West Coast Route displayed an electrically-operated model railway, constructed by Messrs. Bassett-Lowke Limited, in which a West Coast express of the period ran round a track laid on a table passing through various model stations *en route*. The engine was a perfect model of the L.N.W.R. 4-6-0 "Experiment" class, and this was the first electrically-operated and controlled line of this nature to be exhibited in this country. The following year on the same site, at the White City, this model was again shown, and attracted much attention. On this latter occasion, the East Coast route was represented by an excellent model of an East Coast joint stock sleeping car.

Despite all that has been said against Wembley, it was one of the best exhibitions, from the model engineering standpoint, that has ever been held in this country. Many of the best exhibits were on the stands of Indian and Colonial railways. I spent at least a good half-hour examining and admiring the really superb model of the Nigerian Railways latest three-cylinder 2-8-2 tender locomotive, No. 801. Finished in lacquered black, this model, constructed to a scale of 1/12 actual size, was mounted on a length of permanent way in a large mahogany showcase with glass sides, with an electric motor concealed in the base, so that the coupled wheels were made to revolve, and the movements of the external valve-motion shown in operation. I considered this the finest model locomotive exhibit in the show.

Being interested in Indian railways, I spent a considerable time in the course of two visits paid to Wembley, in 1925 and 1926, in making an exhaustive examination of their stands. The best displays were those of the Indian State Railways, the East Indian Railway and South Indian Railway. The North Western Railway, as one of the State lines, exhibited a fine sectional model of one of their railway coaches which gave spectators a good idea of what it was like to travel by rail in India. The East Indian exhibit seemed to be the best; in addition to a handsome model of that line's "P" class 4-6-0 "Mail" engine, there was laid out on a table a most captivating replica of the railway station at Hardwar on the Ganges, a great centre of pilgrim traffic during Melas or Fairs. Everything was there in miniature, the station, platforms, running roads and miniature trains either standing at the platforms or approaching the station from each direction, and also the compound where pilgrims were medically examined on arrival and departure. The little puppets representing the staff, passengers, etc., were all correctly attired, even to the colour of their turbans, and though the model was stationary, the effect to one who had visited India was most realistic.

The South Indian Railway stand was notable for a fine tableau of models depicting the march of transport in South India, showing all phases from the bullock cart and mail tonga, to the earliest South Indian metre gauge trains, consisting of little four-wheeled coaches with their cumbersome overhanging sunshades, hauled by tiny six-wheeled engines, to the modern South Indian corridor mail running on the Ceylon route, and hauled by a modern superheated 4-6-0 tender engine. The whole was set against a scenic background depicting the territory served by the South Indian Railway, varying from a vista of the heavily rolling surf breaking on the beach at Madras, to temples such as those at Trichinopoly and Masulipatam.

To conclude by drawing away from the subject of railway models, I think one of the most arresting things I saw at Wembley was in the Gold Coast section, where, beside a full-size standing model of a Haussa soldier, was a splendid model of a mud-walled Slave Factory, with all its suggestions of the terrors within which carried one's mind back to Cape Coast Castle and the most terrible days in the annals of darkest Africa.

A few years later, at the Newcastle exhibition, I was greatly taken by a magnificent model of a large stern-wheeled shallow-draught river steamer similar to those in use by the Irrawaddy Flotilla Company, between Rangoon and Mandalay. I believe this was exhibited by Messrs. Swan, Hunter and Wigham Richardson; it was well worth a visit to this exhibition to inspect this model alone. The perfection of detail was marvellous.

When 1951 comes along we shall see how far we have progressed in the world of model making since the days of the Wembley Exhibition.—N.D.

For the Bookshelf

Examples in Engineering Drawing, by H. Binns, Volume 2. (The English Universities Press Ltd., Weald Place, Sevenoaks, Kent.) Price 6s. od. net.

This book progresses a stage further than that covered by Volume 1, and consists largely of exercises in producing the usual elevational drawings from isometric sketches. Some useful explanatory notes on dimensions, limits and fits, machining, scales and the like are given in the accompanying text. The page size is uniform with that of the previous volume, and is large enough to ensure that the drawings and all dimensions are clearly legible. The standard of draughtsmanship indicated is high and modern in style. This is a book to be recommended to all engineering students.

On the other side of the lever boss, the wires are brought down in close contact with the edges of the lever, curving away below to reach the anchorage "D" on the fibre pad. This anchorage consists of a 6-B.A. screw and nut, and three brass washers, into which the wires are soldered. (See Fig. 21, diagram of wiring.) The best way to do this, is to cut the wire nearly 1 in. too long, and unwind the insulation for $1\frac{1}{2}$ in., that is $\frac{1}{2}$ in. before the washer. Then cut the wire to correct length. The washers are to have a No. 60 hole drilled through the edge into the screw-hole. Push the tang of a file into the screw-hole; put a spot of non-corrosive resinous flux on the end of the wire, and also on the No. 60 hole with a tiny bit of solder. Keep the wire away while heating the washer on the file over a spirit lamp; go gently if you don't want to lose the solder. When the solder has filled the small hole, bring it away from the flame and quickly poke the wire in the hole. It will set almost immediately. Pull it off the file and remove any obstruction in the screw hole with a round file. Then wind the insulating cotton on the wire right up to the washer and tie the ends together. The heat will have tarnished the washer; just rub a file on its two surfaces to freshen its contacts.

The wires from the fibre pad on the lever to the anchorages "B" and "C," unlike the others, must be flex. We used fine strands on which were threaded a string of porcelain beads.

Regarding the Westinghouse "M3" unit, I obtained several of these direct from the Westinghouse Brake and Signal Co., Pew Hill House, Chippenham, Wilts. I found them most courteous and obliging, there was quite a lot of correspondence between us on the matter.

The "M3" unit is not much bigger than a thimble; five wires come from it; those from the two ends should be twisted together to form the positive terminal, and joined to the positive wire from "A." The central wire is joined to "B." The two intermediate wires are not required, and may be cut off short. Put a touch of solder on all joints. It is essential to make no mistake as to polarity, positive to the two ends, negative to the centre. It is advisable to use red insulated wire for the positive or "live" leads, and any other colour for the return (or earth) leads. The current must be D.C., as it will be if dry cells or accumulators are used. If your mains are A.C., a rectifier must be introduced into the circuit, and, of course, a transformer is required to reduce the pressure to about three volts. As already mentioned, this is by far the most satisfactory method.

To sum up :—"A" is an insulated anchorage with three brass washers, two in the outer compartment for bobbins and Westinghouse, one on the other side of plate "B," in the middle compartment, for the source; all red wires. "B" is insulated, with three brass washers and red wires, all in the outer compartment. "D" on

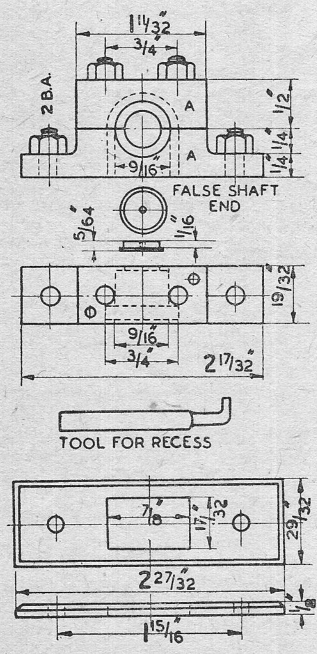
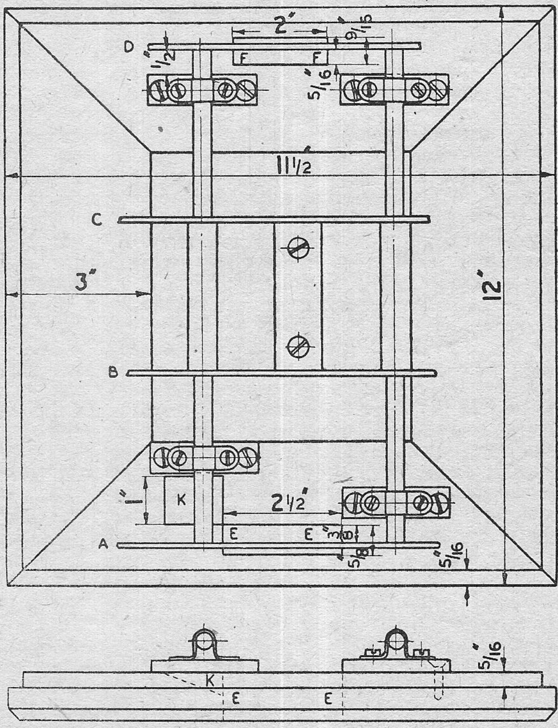


Fig. 22. Plummer blocks



EE. AND FF. ARE WINDOWS CUT RIGHT THROUGH
K. CUT ONLY PART WAY THROUGH

Fig. 23. The wooden base

to show the fixings and windows is now appended (Fig. 23).

The overall dimensions are 12 in. × $11\frac{1}{2}$ in. × 1 in., with a rebate $\frac{5}{16}$ in. × $\frac{5}{16}$ in. all round below to fit loosely into a wooden frame forming the top of the case, and a bevelled edge above. The plan shows it built up around a central core 6 in. × $5\frac{1}{2}$ in., with the 3 in. border mortised into it. It is essential that it should be exactly 1 in. thick, to bring the centre of the plummer blocks which rest on it, in line with the rocking-plate pivots which are $1\frac{5}{8}$ in. above its under surface. Windows are cut to allow the upward projections from the outer plates to pass through; and on the right side the window must also allow for the rocking lever. Ample clearance should be provided, but on the top surface care must be taken to ensure that the steel plates under the plummer blocks safely cover the windows. An excavation "K" must be chiselled partly through the thickness of the wood to clear the lever and its fibre pad.

The "movement" is hung from the base by four hoops $\frac{1}{2}$-in. broad, bent round the pillars, their feet secured by 3-B.A. screws to brass pads $2\frac{1}{4}$ in. × $\frac{5}{8}$ in. × $\frac{1}{4}$ in., screwed to the under surface of the wooden base. Number the hoops, pads and wood with centre-pops. A strip of wood $3\frac{1}{16}$ in. × 1 in. × $\frac{3}{4}$ in. permanently screwed to the base, like the brass pads, locates the position of the movement from side to side by fitting accurately between plates "B" and "C."

Constructing the Weight

In the next instalment I propose to give a rough outline of the essential features of the case, but the weight can be included in the present issue. Personally, I detest a tawdry and tarnished brass-tube weight. In one of my chiming clocks described in THE MODEL ENGINEER for May 20th, 1937, the three weights were clothed with "Russian iron" like the lagging covering which is sometimes used for boilers and cylinders of models; a bronze lid, top and bottom, made a very handsome appearance, but a lot of work. The weight in Mr. Stephens' clock is very pleasing to the eye (Fig. 24). Cast a cylinder of lead $3\frac{3}{4}$ in. diameter by $4\frac{1}{2}$ in. long, with a bore of $1\frac{1}{2}$ in. diameter. Turn a piece of wood 7 or 8 in. long to push tight into the bore, and it will make a better job if before starting to turn it, metal plugs are driven into the ends of the wood, having countersunk holes for the lathe centres. A screw projecting from the wood near the left end will take the place of a carrier.

Push the lead on it; face off the ends to a length of 4 in., and turn it to a diameter of $3\frac{3}{8}$ in., preferably with automatic feed, and leaving a smooth surface. Do not touch it with the fingers, but immediately, before it begins to tarnish, pull the lathe round slowly while applying colourless cold lacquer with a large brush; no lacquer is required on the ends. When quite dry and hard, hammer the wood out, and turn brass lids for top and bottom, with a $\frac{1}{4}$ in. central hole. If you can obtain Tellurium bronze for the lids, they will look even better. They should not fit tightly on the lead, just an easy slip on. They are secured by nuts at each end of a mild-steel rod having a $\frac{1}{4}$ in. Whitworth thread for its whole length. Before screwing it, put it in the lathe and turn the rod down to $\frac{1}{8}$ in. diameter for a length of a good 3 in.; this can be done in three or more steps, pulling the rod further out of the chuck several times, and finally finishing with a file and emery cloth. Then run the Whitworth die on it in the lathe. Bend the eye round a piece of $\frac{1}{2}$-in. rod in the vice.

Looking at the drawing, two rods $\frac{3}{16}$ in. diameter are seen projecting, one on each side, above the top lid. They have bent eyes into

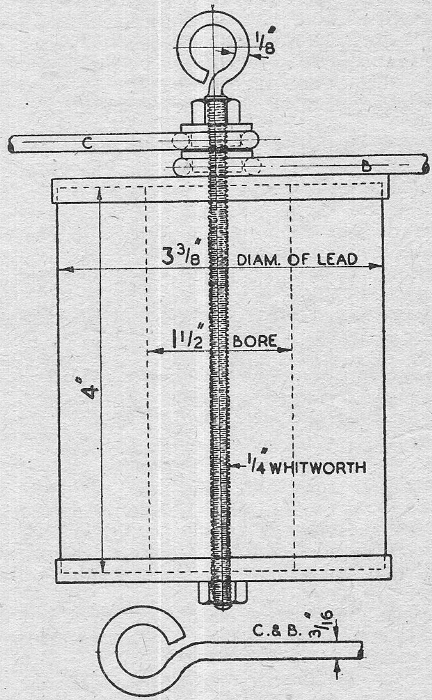


Fig. 24. Weight

which is slipped a flanged washer with a $\frac{1}{4}$-in. hole in it. The nut holds them firmly on the lid. One of them slides up and down with the weight in a long slot formed by two strips of wood screwed to one of the pillars of the case; this keeps the weight from rotating and unravelling the line, and also, when the clock is being wound, it strikes a lever on reaching the top, tilting a mercury switch to cut off the current from the motor.

The other rod, a safety precaution, strikes another lever, tilting a duplicate switch in case of failure of the first. This mechanism will be described later.

Judging from our own clocks, this weight will be just sufficient to run the clock, with not much margin to spare. The $1\frac{1}{2}$-in. bore is for the addition of make-weights, as required, in the form of lead discs of various thicknesses, threaded on the screw.

(To be continued)

quarters when it was working. I was on the small platform with the driver for about an hour. The maker's name was Walker, Tewkesbury, Gloucestershire. I have since then seen two machines which appear to be the same make, but I cannot be sure.

Yours faithfully,
Andover. O. T. WICKS.

Workshop Ideas

DEAR SIR,—Mr. Henry L. Parsons, in his letter on American type tool-holders for lathes, page 154, *ante*, points out that height adjustment can be carried out, without the aid of packing strips, by rotating the curved packing-piece on its seating.

The weakness of this type of tool-holder is that excessive adjustment in this manner alters the top rake, clearance, and cutting angles. As an example, raising the tool height by this method, may mean, in the case of a fine clearance-angle (as in cutting annealed tool steel, 6 degrees) that the tool would, in fact, be rubbing, and thus cause deterioration of the cutting edge. Conversely, lowering the tool height might reduce the top rake angle below the optimum for efficiency. Thus the use of packing strips is not entirely obviated.

I agree with Mr. Parsons on the subject of reversing switches on lathe motors. I have fitted one to a Myford "M" $3\frac{1}{2}$-in. lathe which I am installing in my workshop, and hope (delivery of motor permitting) to have running soon.

In conclusion, I would like to express my appreciation of workshop ideas sent in by others. If they are not always quite to my taste or requirements, they do stimulate further ideas or improvements of my own.

Yours faithfully,
Woodthorpe. T. D. COLLIER.

DEAR SIR,—With reference to Mr. Parsons' letter in THE MODEL ENGINEER, in which he criticises my description of an American type tool-post, I am sorry that he thinks that I have "missed the whole point" of this component by omitting to describe a suitable packing-piece and collar.

I have not been unaware of the existence of such items, but would like to state that the tool-post I described was used, so far as my memory serves me, for many years without any packing for the tool. Therefore, I cannot agree that these parts are "essential."

An Armstrong holder was used in conjunction with this post, as stated in my article, and it was found that adequate height adjustment was obtained by sliding the cutter farther in, or out of the holder as required.

No doubt, many readers will wish to make the parts described by Mr. Parsons, but they will be aware of its obvious disadvantage.

Yours faithfully,
Manningham. JOHN K. MOLD.

Clubs

Whitefield Model and Engineering Society

At our last meeting, held on Friday, February 8th, a very interesting lecture was given by Mr. Garside, on "The Principle and Operation of Locomotive Injectors." Owing to the very bad weather, this meeting was not very well attended, but no doubt Mr. Garside could be persuaded to give this talk again at some future date.

The club meetings are still held fortnightly, on Fridays, at 7.30 p.m.

Secretary: A. STEVENSON, 2, Newlands Drive, Prestwich.

Mancunian Model Engineering Society

A very interesting visit to the Manchester Dry Docks took place recently. The workshops were visited and later we went on board several boats in for repair. Three visitors joined us on our visit. Visitors are always welcome any Friday, 8 p.m., Girls' Institute, Mill Street, Ancoats.

Hon. Secretary and Treasurer: J. R. WOOD, 1, East Road, Gorton, Manchester.

West London Model Engineers Society

The Society meets regularly every 1st and 3rd Monday in the month, at the Queen's Head Hotel, Brook Green, W.6. Our membership is rapidly increasing; keen interest is shown in the building of the Club locomotive "Princess Marina." Mr. Kennion, of Kingsland Road, Shoreditch, E.2, has graciously acknowledged the order of castings by presenting the Society with the taper barrel for the boiler.

A model racing car section has now been formed, and at the moment there are six cars under construction. For further details of the Society please apply to the Hon. Secretary and Treasurer: T. H. LEWIS, 21, Penrard Road, Shepherd's Bush, W.12.

Model Yacht Sailing Association

The race for the "Dacia" challenge cup for ten-raters, will be held on Monday, April 22nd, on the Round Pond, Kensington Gardens. Full particulars can be obtained from the Hon. Secretary: E. PORTER, The Club House, Kensington Gardens, London, W.8.

Croydon Society of Model Engineers

This Society is now well into its stride, and meetings are beginning to become uncomfortably overcrowded! A recent lecture by Mr. Westbury brought a full house, and a "good time was had by all!" There is still room to squeeze in a few new members, so any lone hands in the district should join up without delay. The Society has recently become affiliated to the S.M.E.E., and is looking forward to taking its share in the forthcoming exhibition. The election of officers takes place on March 21st.

Hon. Secretary: L. G. BOOMER, 11, Tritton Avenue, Beddington, Croydon.

THE "MODEL ENGINEER" SALES AND WANTS

Private: **Threepence** *word*. *Trade*: **Sixpence** *word*. *Use of Box* **2/6** *extra*. *Minimum charge*, **3/-**

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road' London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Silver Steel Rounds, Squares, Asbestos Sheet, String, B.M. Steel Rounds, Squares, Angles, Flats, Brass Rounds, Squares, Flats, Hexagons, Sheets, Copper Tubes, Rounds, Squares, Sheets, Screws, Nuts, Drills, Taps, Dies, Rivets. S.A.E. for lists.—S. REED & SON, 89, Keresley Road, Coventry.

Copper Tube for Boilers, $\frac{3}{8}$″, $\frac{1}{2}$″, $\frac{3}{4}$″, 2″, $2\frac{1}{2}$″, 3″, $3\frac{1}{2}$″, $4\frac{1}{2}$″, and 6″ 20-g. to 14-g. $\frac{1}{4}$″ square copper rod, round copper rod all sizes, steel angles, $\frac{1}{2}$″, $\frac{3}{4}$″ and 1″; bright steel for frames, 1/16th, 3/32″, and $\frac{1}{8}$″ thick, 2″ to 4″ in width. Unlimited quantities of the above cut to your length. 5 c.c. aero engine castings and blue prints, 25s. per set. 10 c.c. aero engine castings and blue prints, 35s. per set. All supplies for the model engineer.—BROADWAY (BRISTOL) ENGINEERING Co., Wellington Hill West, Bristol 9.

Split Chucks for Watchmakers Lathes, 6 mm., $6\frac{1}{2}$ mm., and 8 mm., at 6s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

" Tool News " keeps you up-to-date. Specimen copy 6d., post free.—GARNERS, Sheffield Road, Barnsley.

Self Centring Chucks, Burnerd 4″, price £4 17s. 6d.; Crown, 4″, £3 12s. 6d.; Independent $4\frac{1}{2}$″ Burnerd, 50s.; 6″, £3 17s. 6d.; Crown, 6″ Independent, £3 2s. 0d.; Backplate Castings, 4s. 6d.; High Speed Lathe Tools, $\frac{1}{4}$″, 5/16″, and $\frac{3}{8}$″ sq., 20s. set of eight; Copper Tube, $\frac{1}{8}$″ to 7″ diameter. Cash or C.O.D.—CORBETT'S (LATHES), Stanton Hill, Mansfield. Telephone 583 Sutton-in-Ashfield.

Sensitive Bench Drill, $\frac{1}{2}$″ capacity, 2 speed, adjustable table, £6; 1/3 h.p. B.T.H. Motor, 240 volts, nearly new, £5; Grinding Head, 5″ wheels, £1 5s. Fridays after 7.0 p.m.—59, Deancroft Road, Eastcote, Pinner.

Wanted, 4″ or 5″ Woodworking Lathe, complete with motor, or just lathe.—T. SLASSOR, 40, Searle Street, Cambridge.

Wanted, First class 3″ 3-jaw S.C. Chuck, dial indicator, vernier height gauge, f 2.8 3″ camera lens.—TREHERNE, c/o TRE, Malvern, Worcester.

For Sale, Collet Motion and Collets, etc., suitable for 5″ Southbend lathe, £7; ditto suitable for Atlas lathe, both little used. Also 5/16″ Herbert Automatic Die Head and Chasers, £3.—The Lawns, Ascot.

Wanted, Four Sheets Brass, $6\frac{1}{2} \times 6\frac{1}{2} \times$ 1/16, flat.—E. S. BRADBURNE, Alison, Buxton, Derbyshire.

For Sale, 5 sets H.S. No. Drills, 1-70, 43s. per set with stands, new; small quantity H.S. Reamers and End-mills, $\frac{1}{2}$″-1/16″, 3s. to 6s. 9d. each, new; one 1/3 h.p. 3 phase 440 v. Motor, nearly new, £5.—T. W. SMITH, Ratcliffe Culey, Atherstone, Warwickshire.

What Offers? Brown & Sharpe's 6″ Vernier Caliper, Dial Test Indicator, No. 625, Planer & Shaper Gauge, 12″ and 20″ Steel Straightedges, Combination Bevel, Starrett's Vernier Depth Gauge, Micrometer 1″-2″ by thousandths. All new. Full particulars.—PRICE, 53, Roderick Road, Hampstead, London.

Wanted, 8 and 6 mm. Watchmakers' Lathe Collets.—139, Hamlin Lane, Exeter.

Wanted, Small Power Shaper, Planer, Lathe, Milling Cutters, Miller, $\frac{1}{4}$ to $\frac{1}{2}$ h.p. A.C. Motors, and other useful workshop equipment. Wanted, at reasonable prices. What have you got?—W., 80, Ridgeview Road, London, N.20.

Wheeler Milling and Gearcutting Attachment, £9 10s.; 4″ combination chuck, self-centring independent, 50s.; rack-and-star-wheel action for Southbend poppet barrel, 45s.—110, Manor Way, Mitcham, Surrey.—Pollards 5848.

Wanted, Die, nine mm. diameter × 1.0 mm. pitch. Consider set metric fine threads. Write—BM/MBW, London, W.C.1.

Littlefield, Marlborough College, Wilts., 1939-45 War Memorial Workshop. The following equipment is sought: 4″ Wood Turning, and $3\frac{1}{2}$-4″ Screwcutting all-purpose Lathes, Pillar Drill (cap. $\frac{1}{2}$″), Tool Grinders, all powered by independent motors D.C. $\frac{1}{2}$ h.p.; Hand Shaper, 6″-10″, Benches and Vices for metal and woodwork. Gifts of the above, or information where they may be obtained at low cost, will be welcomed by the Hon. Secretary, Lt.-Col. A. E. TITLEY.

Wanted, Set of Change Wheels for 3″ Lathe, 20 to 100 in 5s. Particulars to—GOLDSPINK, Ightham, Kent.

7/16″ Bench Type Pillar Drill, £4 10s.; 9/16″ British Supreme ditto, £6 15s.; $\frac{1}{2}$″ ditto with Motor Platform, £6; $\frac{1}{2}$″ Holbrook Bench Drills with Motor Platform, £5; various Floor Mounting Drilling Machines; No. $1\frac{1}{2}$ Square Slide Flypresses, £4; No. 2 ditto, £4 10s.; No. $2\frac{1}{2}$ ditto, £5 5s.; No. 3 ditto, £6; No. $1\frac{1}{2}$ Vee Slide Flypresses, £6; No. 2 ditto, £6 15s.; No. $2\frac{1}{2}$ ditto, £7 10s.; No. 3 ditto, £9; all presses reconditioned and supplied with handle and ball weights; Power Hacksaw Machines, belt driven and motorised; various Polishing Heads, cheap. All carriage paid.—H. KNAPTON (MACHINE TOOLS) LTD., Friston Street, Birmingham.

Wanted, 3″ to $3\frac{1}{2}$″ Lathe. Treadle or power. Please send details to—JESSUP, 1, Heathwood Gardens, Swanley, Kent.

Lathe Reconditioned. We invite enquiries for repairs and overhauls to all types of Machines, hand scaping to fine limits.—THORNTON & SHEARD, Engineers and Oxy-Acetylene Welders, Bunkers Hill, Golcar, Huddersfield.

Wanted, Small Jig Saw, or Band Saw, or Fretsaw Machine, motorised for lighting power.—GLOVER, 2, Norwood Avenue, Lowton St. Mary's, Nr. Warrington.

Three Speed Foot Motor, suit 3″ lathe, new, £2 15s.; Myford $3\frac{1}{2}$″ Chip Tray, £1; Myford Vertical Slide, swivelling, new, £2 10s.; 3″ and 4″ Bell Chucks, screwed $\frac{3}{4}$ Whit., 5s. each; 4 cylinder Magneto, £1. Carriage extra.—PARSONS, 1822, Bristol Roads, Rednal, Birmingham.

Wanted, 3″ to 4″ B.G.S.C. Lathe with chucks. Give particulars, price, where seen to—G., 79, London Road, Wembley, Middlesex.

Wanted, Myford Bench Lathe, $3\frac{1}{2}$″ or $3\frac{1}{8}$″ motorised, must be good working order.—SHERIDAN, 50, Manor Drive, Esher. Tel., Emberbrook 1596.

Wanted, Lathe, 3″ to 4″ S.C. or Adept Super. Write—"Woodcote," Highlands Road, Fareham, Hants.

For Sale, $4\frac{1}{2}$″ B.G.S.C. Lathe, slide rest fitted with 4-way tool post, 25/32″ hole through mandrel, 3-jaw Chuck, back plates, etc., complete with chip tray. Very sturdy machine. Price £35.—WARD, 119, Roehampton Vale, S.W.15. Put. 6167.

Flextol Power Driven Flexible Tool, fitted 415 volts A.C. Motor, with sanding and drilling tools, excellent condition, £80 or near offer.—HENRY & FARTHING LTD., 33-37, Bell Street, London, N.W.1.

Wanted, $3\frac{1}{2}$″ to $4\frac{1}{2}$″ Centres B.G.S.C. Lathe.—G.F., The Green, Calne, Wilts.

Colchester 6″ Lathe, S.C., Taper Turning attachment, Denbigh Milling Machine, small Pedestal Milling Machine, various small tools, chucks and electric motors to 3 h.p., single phase.—WATKINS SERVICE GARAGE, High Street, Banstead, Burgh Heath 1414.

ELECTRICAL EQUIPMENT

Electradix Bargains include:

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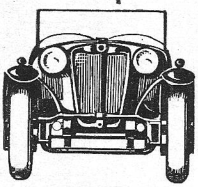

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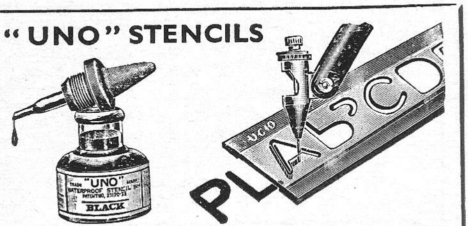

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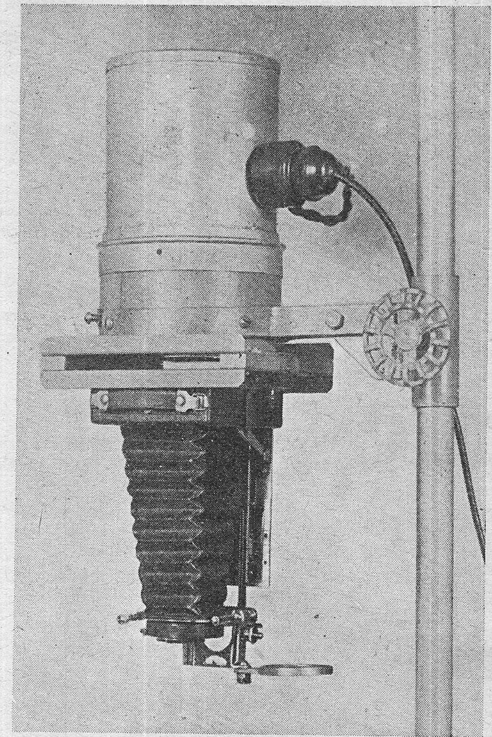
A Low-Voltage Photographic Enlarger

By C. R. JONES



IN my first articles for THE MODEL ENGINEER, the accompanying photographs were mostly taken with an old half-plate field camera, bought cheaply at a sale some years previously, and, as there were some half-plates among the accessories with the camera, these were used to photograph the various tools and equipment.

As the war progressed, these plates gradually got used up and efforts to obtain more failed; but then a few quarter-plates were obtained and were used by means of adaptors made to fit the dark-slides.

The day arrived when these also came to an end, but I still had a dozen $3\frac{1}{2}$-in. × $2\frac{1}{2}$-in. plates left; so it was decided to try these, and a few were used, adaptors again being made.

About this time a $3\frac{1}{2}$-in. × $2\frac{1}{2}$-in. double-extension plate camera, with *f* 6.3 Anastigmat lens, came into my possession, and also some more plates to suit; so I resolved, if possible, to stick to this size as standard.

As a contact print this size is rather small to show much detail, some sort of enlarger was indicated; but, as our present abode does not boast electric light, the only thing seemed to be to experiment with an enlarger using a car battery and headlamp bulb as light source.

After much studying of literature on photographic enlargers, means of lighting, etc., in collaboration with a friend who is an enthusiastic photographer, and a considerable amount of experimentation with a 4-in. condenser, a 6-volt, 36-watt headlamp bulb, a 6-volt car battery and the folding camera previously mentioned, not forgetting a circular piece of frosted or ground glass laid on top of condenser, which I found most necessary to obtain even lighting, eventually a design was worked out and the vertical enlarger made up as shown in the photographs and drawings.

This has proved to be very successful and reliable, and it may be of interest to photographically-minded readers who are not blessed with the electric mains, (also, I hope, to those with) but wish to enjoy the benefits of being able to make the most of their negatives.

An exploded view of the various parts of the main body of the enlarger is shown in Fig. 1. Taking these in the order they were made, first the two identical pieces *A*, were made from sheet-steel, about 1/32 in. thick, the said pieces being perfectly flat.

These were cut out to the sizes indicated, with the opposite edges turned over at right-angles, as shown, and the openings cut out in the exact centre. These openings were cut after marking-out and clamping the two pieces together, by means of an "Abrafile" and then filing to finished size.

It will be noticed that the openings are only $2\frac{1}{4}$ in. × 3 in., and not $3\frac{1}{2}$ in. × $2\frac{1}{2}$ in.; this is because, during the experimental stage, it was found that the 4-in. condenser (the only one available) would not cover the full size. But it has been found that, for all practical purposes, this size of opening is large enough, as it is rarely that the whole of a negative is required to be enlarged. The fixing holes were drilled later.

The next things made were the two strips, *B*. These were of $\frac{3}{4}$ in. × $\frac{3}{8}$ in. M.S., and were cut off and finished to $6\frac{1}{8}$ in. long.

The condenser housing, *C*, is really the centre of the whole design, and was made from a motor head-lamp shield. There should be plenty of these available now that the blackout regulations are lifted; and, if a discarded one can be obtained, the inside should be removed after unscrewing the plate it is affixed to, and the top or outer end cut off until it looks like *C*, Fig. 1. I found that this would just house the condenser and its mount nicely. Most of these head-lamp shields (or masks) seem to have eight $\frac{3}{16}$-in. holes in the flanged portion; only four of these are required in the present instance; that is, two opposite pairs are used, the parts *A*, *B*, and *C* being bolted together by means of $\frac{3}{16}$-in. round-headed Whitworth set-screws and nuts.

It is important to see that the condenser housing *C*, is fixed quite centrally over the openings in the negative-stage, *AA*.

*IGNITION EQUIPMENT

By EDGAR T. WESTBURY

A comprehensive review of the working principles, design and construction of electrical ignition apparatus employed on all types of internal combustion engines

Part II—Design and Construction (*Continued*)

SEVERAL readers have asked my opinion on the possibility of adapting or converting various types of small generators to work as magnetos, either for producing high-tension current direct, or for producing low-tension current to energise ignition coils. I have already expressed my opinion on the subject of low-tension magnetos, and have very little to add to these observations, though I am aware that in full-size practice, the idea of the low-tension magneto-cum-coil system has been revived in an improved form. A sketchy description of such an ignition system has recently appeared in the Press, in which it is stated that the magnetos are fitted with a low-tension distributor, feeding current to separate coils (or "transformers," as they are termed), for each of the cylinders. These coils are said to be incorporated into the sparking-plugs.

In the absence of more exact information about this system, it is futile to attempt to comment upon it in detail, but it would appear to be a reincarnation of a very old idea, which was tried and found wanting in the early years of this century. This does not preclude the possibility that its revival in an improved and up-to-date form may be much more successful; but on the face of it, there seems to be very little practical advantage in this system, either in cost, complexity or efficiency, over a modern high-tension magneto, and there are grounds for criticism in the idea of a combined coil and sparking-plug. Even this detail of the system is not entirely without precedent, as the old Bosch "Magnetic" sparking-plug, which worked on low-tension current, and incorporated a vibrator or "trembler," having the contact points inside the combustion chamber of the engine, seems to have anticipated some of its features. As a matter of fact, the old adage, "There is nothing new under the sun" seems to apply to ignition appliances as much as to anything else. I worked for a long time on the principle of energising an ignition coil by the sudden discharge of a large-capacity condenser, after charging it from a small battery or generator; and I believed the idea to be entirely new, until one day a friend, who knew of my weakness for collecting ancient text-books, handed me an early book on ignition, which contained a description of an almost identical system!

The querists referred to above have suggested making use of such devices as telephone generators, cycle dynamos, and small dynamos and motors as sold before the war in toyshops. I would not rule out the *possibility* of converting any of these devices, given sufficient time and perseverance, but whether it would be easier than starting from scratch and building one completely, is quite another matter. Many of the generators in the classes referred to above are of the rotary-armature type, and I have already stated that magnetos of this type involve far more difficult work, both in mechanical and electrical operations, than those of the rotary-magnet type. The constructional design of "toy" dynamos is generally quite inadequate for a machine which must maintain reliability under conditions of rough usage. Cycle dynamos are nowadays made of fairly robust construction, and often have rotary magnets, so that they offer better prospects for conversion, but I have not yet encountered any type of dynamo in this class in which conversion would be easy or straightforward. Many of these machines are of the multi-polar type, having several separate windings connected in series or parallel, so that re-winding to produce high-tension current would be abnormally difficult; while in others, the winding space available for a single coil, having primary and secondary windings, with efficient insulation, is quite inadequate.

I have given very careful thought to the possibility of producing a magneto of the axial or "barrel" type, having the essential working parts arranged in much the same way as in one of the most popular types of cycle lighting dynamos. Some experiments have been made on these lines, and a sufficient degree of success attained to indicate that the principle is worth serious consideration; but again I must point out to readers that results are not yet conclusive, and the efficiency attained so far is inferior to that produced by the more straightforward principles employed in the "Atomag Minor" and similar magnetos. The "barrel" type of magneto, however, has the advantage of extreme compactness, though it may not necessarily be any lighter than the normal type; it is also very easy to enclose completely for the protection of both electrical and mechanical working parts.

Design of Barrel Type Miniature Magneto

Three magnetos of this type have been constructed, the main difference in them being in the amount of iron used in the stator poles and limbs. As it is hardly practicable or advantageous to laminate these, it has been considered desirable to cut down the iron to the minimum. The first magneto which I constructed on these lines had pole shoes ¼ in. thick, and was found rather inefficient, especially at low speeds. This was thought to be due to hysteresis loss in the iron, the quantity of which was reduced in the second magneto, and still further in the third, with a gain in efficiency at each stage;

* *Continued from page* 218, "*M.E.*" *February* 28, 1946.

in position. The object of this is to avoid any projection from the end of the shaft, which would necessitate lengthening the casing, as the shaft must at all costs be kept a safe distance from the coil. In other respects, the rotor itself is identical with that of the "Atomag Minor," including the disc magnet, solid pole-pieces, and brass cheeks.

Laminations versus Solid Iron

It would appear that the entire success of this type of magneto, and also the concentric-coil flywheel type illustrated in Fig. 72, depends upon the rapidity of flux change which can be produced in the solid iron stator, as compared with a completely laminated structure. There is very little real data available on this point, but in nearly every case where it is necessary to arrange for rapid flux changes, a laminated structure of the magnetic circuit is much superior to one of solid iron. In magnetos, the use of laminations seems almost universal at the present day, but at one time, most rotary-armature machines were fitted with magnet pole shoes of cast-iron. One of the most noticeable advantages of changing over to laminated pole shoes was a great improvement in the low-speed sparking performance. At first sight, it may appear illogical that the low-speed end of the range should be the most influenced, but the reason is that the rate of change of flux due to armature movement only represents a part of the source of inductive efficiency in a magneto. The really important factor in producing a spark at low rotor speed, in any form of magneto, is the "snap-over" of the flux as the primary circuit is interrupted by the contact-breaker; and there is reason to believe that this takes place much more quickly when all parts of the magnetic circuit are laminated.

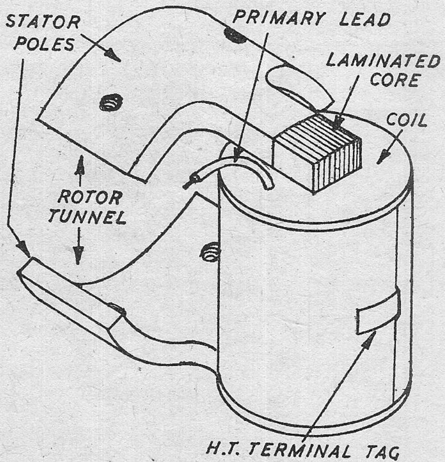


Fig. 74. Isometric view of stator and coil for barrel type magneto

It is quite possible that this property may prove to be a limiting factor in the success of any form of magneto in which laminations cannot be used to full advantage. The use of the minimum quantity of iron will help to reduce lag, but only at the expense of electro-magnetic efficiency. There may possibly be materials which are superior to ordinary iron in this respect, but most of the special high-permeability alloys are unsuitable for this particular purpose, because they will not carry a sufficiently high flux concentration.

In some of my experiments, I have made use of electrolytically-deposited iron, which is as near pure iron as can be obtained commercially. This material is not produced on a large scale, so far as I am aware, but I have been able to obtain small quantities from one or two manufacturers who are exploring its possibilities. Unfortunately, however, the range of sizes in which it is made is very limited, and I have found it necessary to machine the required parts from the solid. It machines readily, and has a texture somewhat like very fine-grained cast-iron, though very much more ductile than the latter. Annealing is not necessary, unless the hardness is increased by forging, rolling or bending. Up to the present, no very conclusive data as to the electrical superiority of this material over ordinary soft-iron or mild-steel is available, but if any readers have had experience with this or other materials which offer possibilities for improving magnetos, I should be glad to have their advice on this matter.

(*To be continued*)

A Photographic Enlarger

(*Continued from page* 261)

The enlarger is mounted on a base-board made of wood 1 in. thick, and 18 in. square, with battens underneath, and I always use it with the column to the right, as this brings the switch and hand-wheel to a convenient position.

The lamp-holder *H*, was wired up with very heavy flex to a 5-amp. socket, which is bolted to the side of lamp-house and can be seen in the photographs, the plug belonging to the socket being wired to the switch and then on to two large crocodile clips which clip on to the battery, again using heavy wire.

The inside and outside of the lamp-house is painted silver, the inside of the condenser-housing being dead black. The rest of the enlarger, excepting column, is enamelled grey.

In use, the condenser is placed in position; on top of it is placed a circular piece of ground glass; lamp-house placed in position; the camera is then affixed; battery connected and lamp focussed to give the most even lighting. Once focussed, I have not had to alter the adjustment of bulb.

I have not, so far, made up a proper negative-carrier; for films I use two pieces of glass hinged together with passe-partout, and with glass negatives I simply lay them on one piece of glass and insert them in the negative stage.

With the enlarger at the top of column, enlargements can be made up to 13 in. × 18 in.

A final word of warning, don't forget to make sure when mounting enlarger on supporting bracket, to see that it is square each way with the column, also that the column is the same with the base-board.

shown in the end elevation, holds the dogs and the bars from riding up out of engagement with the tappets. If lever 1 were pulled the tappet would move in the direction of the arrow, and the bevelled notch would force the locking dog out of engagement, causing the dog and bar to move towards the right, and thus pushing the other dog into engagement with the tappet of No. 3 lever. The action of pulling No. 1 lever would lock No. 3 in its normal position, while conversely it will be seen that if 3 were pulled No. 1 would be locked in *its* normal position.

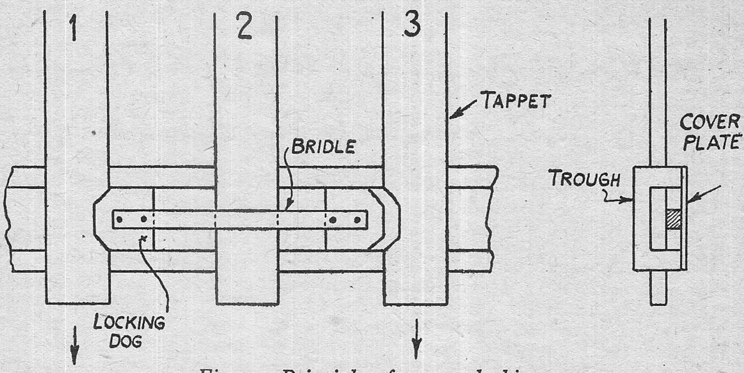


Fig. 7. Principle of tappet locking

In the Stevens frame the locking troughs have two channels, as shown in Fig. 8, and space for five locking bars, three above the tappet, and two below. The need for making provision for more than one locking-bar in each trough will be apparent from a further study of Fig. 7; were it necessary to fit a locking dog to engage with lever No. 2, the bar would have to be placed either above or below that connecting 1 and 3; bars connecting other dogs might well have to

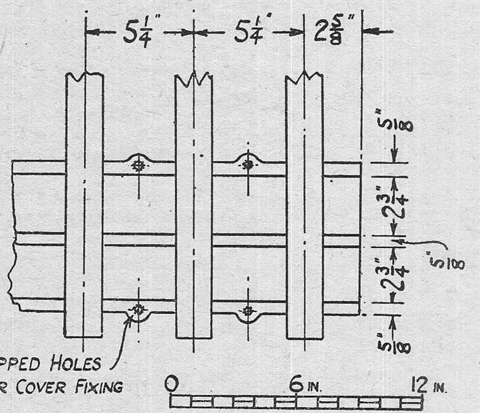
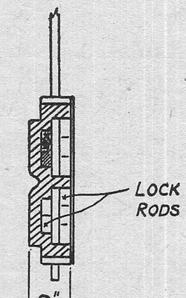


Fig. 8. Stevens frame. Locking trough



pass through on a frame having much locking. In the Stevens frame, the tappets are 1¾ in. wide by ⅜ in. thick and, as shown on the general arrangement drawing, Fig. 1, they are curved to correspond with the movement of the lever. They are slotted at the point of attachment to the lever, a lug portion being forged up to provide a suitable bearing for the link-pin. Provision is made for the fitting of six locking troughs at the rear of the frame, and four more at the front. The troughs are supported on bracket castings as shown in Fig. 9, which are bolted to the standards.

Summing up, the action in the Stevens frame is very simple; the lever is straight, and drives the tappets directly, though the mechanism has one disadvantage on this account; the stroke of the tappets, particularly those farthest from the lever fulcrum, is long and one extends as much as 17 in. beyond the locking-box. The locking troughs, in tiers one below the other, are not easy of access when alterations have to be made; but despite this the design has proved popular in Scotland, and countless frames have rendered yeoman service on the Caledonian, North British, and Great North of Scotland Railways.

Lastly, a word about the painting. The floor-plates are usually painted black, and the parts below the floor either black or battleship grey. The levers are coloured according to their function, as follows :—Ground discs, shunt and other subsidiary signals, main running signals, except distants, lever painted *Red*; Distant signals, lever painted *Yellow*; Points, lever painted *Black*; Facing point locks, lever painted *Blue*; Spare levers, lever painted *White*.

(*Continued on page* 270)

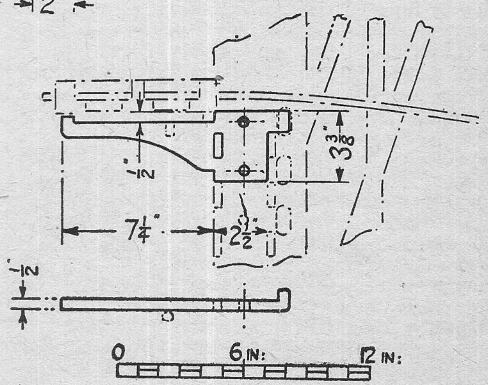


Fig. 9. Stevens frame. Support for locking trough

tice, to try and please the friends and relations of Inspector Meticulous! However, the older type of boiler mountings can be used by those who so desire; the chimney should be a little fatter than the standard "A1" or "A3," and a three-jet blast nozzle, or a pepper-box cap, fitted in place of the usual pattern. That is another thing we can detail out when the time comes. Regarding the dome, if a disc-in-a-tube regulator is fitted, the ordinary type and size of dome can be used, and the choice of this is again a matter for the builder.

There is one point I want to emphasise, and that is this: that the outline drawing given in the first instalment, is not absolutely binding *for details*; it was just intended to be a sort of picture showing the general appearance of the engine. If, for instance, I find that it would be an advantage to add a couple of miniature guide-bars to keep the valve cross-head in the straight and narrow path, they will be duly specified, described, and illustrated in the detail drawings of the cylinders and motion; and so with other components.

Timid Beginners!

Some newcomers to our craft, want to build the "Lassie" as a first attempt; but think that, as specified, it is rather a large lump of cake to cut off for a first meal, and suggest using two outside cylinders only. There is really nothing to be afraid of in fitting the three; if you can machine up two castings, there should be no difficulty whatever in tackling a third. However, I don't wish to press anybody against their own wishes; if you want only two cylinders, go ahead and fit them, but remember that in order to get something like the equivalent power, the cylinders should be bored out to the extreme limit the castings will allow. Also, don't forget that the crankpins in the wheels should be set at right angles (90 degrees) right side leading.

Larger and Smaller "Lassies"

Owners of $1\frac{3}{4}$-in. gauge railways who wish to build a "Lassie" half-size, to suit their own line, can easily do so by halving the principal dimensions, and making what small adjustments are necessary. The main frames and cradle should be $\frac{1}{16}$-in. steel, with buffer and drag beams of $\frac{1}{2}$-in. by 3/32-in. angle and flat strip respectively. Bogie frames $\frac{1}{16}$-in. throughout, the plate centre-piece being of same material, and the bolster ditto, with a $\frac{3}{16}$-in. bogie pin. Either two or three cylinders can be used; if two only, make them $\frac{5}{8}$ in. by $\frac{7}{8}$ in., and if three, $\frac{1}{2}$ in. by $\frac{7}{8}$ in. Gresley two-to-one gear should be used for the inside cylinder, whether the outside valves are operated by Baker or Walschaerts. Where "scale" appearance is a secondary consideration, and a locomotive which will make a long non-stop run with a dozen coaches is more important, the two-cylinder job with loose eccentric valve-gear set to cut off at about 60 per cent. of the stroke, plus an oil-fired water-tube boiler, would be the "cat's whiskers." For a live passenger-hauling engine on gauge "1," the three-cylinder job, with a coal-fired loco-type boiler increased to $2\frac{1}{4}$ in. diameter at the smokebox, and the same general interior arrangement as I shall specify for $3\frac{1}{2}$-in. gauge except for fewer and comparatively larger tubes (six $\frac{3}{8}$-in. and one $\frac{5}{8}$-in.) would do all that is needed. Wheel diameters would be, bogie $1\frac{3}{16}$ in., coupled $2\frac{1}{2}$ in., trailing $1\frac{3}{8}$ in.; all axleboxes with single springs. In place of the radial axle, a pony-truck pivoted to the ash-pan, as on "Fayette," would be a better proposition, both for negotiating the usual sharp curves found on a gauge "1" "scenic" railway, and for cleaning out the firebox. Incidentally for the former reason, a tender mounted on two four-wheeled bogies would be far more suitable than the rigid wheel-base one.

No Good at All!

Coming to the $2\frac{1}{2}$-in. gauge queries, several readers who have actually started on, or obtained castings and material for the commercial $2\frac{1}{2}$-in. gauge "Flying Scotsman," want to know if same can be used or adapted to build a $2\frac{1}{2}$-in. gauge edition of the "Lassie." I'm afraid that the only parts that could be utilised at all, are the wheel castings. The frames of a $2\frac{1}{2}$-in. gauge "Lassie" would need to be 3/32 in. in thickness, against the $\frac{1}{16}$ in. of the commercial design; the latter's unsprung bogie wouldn't do at any price, neither would the cylinders and motion, nor the boiler. About the best thing prospective $2\frac{1}{2}$-in. gauge builders could do, would be first to obtain the set of blueprints for my $2\frac{1}{2}$-in. gauge "Green Arrow." I don't make nor sell blueprints, but would give an address where *genuine* ones (very important that!) can be obtained, to anybody who sends a stamped self-addressed postcard. The outside cylinders and motion of the "Green Arrow" could be used exactly as shown, also the Gresley two-to-one gear; but instead of connecting the inside cylinder to the middle axle, it could be shifted up forward and arranged to drive the leading coupled axle, the valve-spindle link on the inside end of the Gresley floating lever, being turned the other way about, as the valve-spindle would be ahead of it instead of behind it. "Green Arrow" or "Ada" cylinder castings could be used for the outside cylinders; and for the inside one, the casting supplied for "Olympiade" or even that old dowager "Helen Long" (may her shadow never grow shorter!) would do. However, if there should be sufficient demand, I dare say our worthy friends who are supplying the castings for the $3\frac{1}{2}$-in. gauge "Lassie" would oblige with corresponding smaller specimens.

Regarding general details and dimensions, the illustrations given for the $3\frac{1}{2}$-in. gauge engine could be used, reducing sizes in the proportion of 7 to 5. The three cylinders should be $\frac{11}{16}$-in. bore and $1\frac{1}{8}$-in. stroke; if two only are preferred, bore them as big as the castings will allow, say $\frac{13}{16}$ in., or even $\frac{7}{8}$ in., but don't forget that on a two-cylinder job, the cranks have to be set at right-angles. The wheel diameters would be, bogie $1\frac{5}{8}$ in., drivers $3\frac{5}{8}$ in., trailing $1\frac{3}{4}$ in. A single overhead spring would suffice for each bogie axlebox, these being of the kind specified for "Green Arrow," "Ada," etc. At the trailing end, instead of radial axleboxes, a pony-truck could be used, as on old "Fayette"; or sufficient freedom on the average $2\frac{1}{2}$-in.

big boiler under given conditions, a pit of exactly similar size would form in a little boiler under the same conditions. That pit wouldn't matter overmuch in a boiler made from $\frac{5}{8}$-in. steel plates; but in a boiler made from $\frac{1}{8}$-in. plate, there is half the thickness of the metal eaten away at one fell swoop, and the consequent weakening of the whole issue is obvious.

I think the above little dissertation clears up the principal points raised in the various letters. There is only one query about the drawings which have been published to time of writing, and that is easily disposed of. Three readers want to know where the distance-from-front-of-frame-to-cylinder measurement should be taken, as the cylinders are inclined. The angle of inclination is so small that there is hardly anything in it; but if the measurement is taken at the arrows (half way down the inside cylinder and at the top of the outside cylinder) and the squares set out accordingly, the marking-out will be all O.K. Next job, radial axle.

Books on Valve-Gears

New readers and beginners continually write and ask where they can get a book fully describing some valve-gear or other; so to save another batch of correspondence, the following notes might be of interest. There is no "official" book, or any "official" blueprints of the Baker valve-gear in this country; but the Pilliod Company, of 30, Church Street, New York City, U.S.A., issues a comprehensive little handbook fully describing and illustrating the gear. It also contains valve-setting instructions, cut-off tables, and a lot of other useful information, plus some pictures of the gear applied to actual locomotives. It used to be sold for 25 cents, and mailed to any part of the world. I brought a dozen copies back with me, and gave them all away to friends of the footplate.

About the best explanation of the Stephenson link-motion that has ever been written and illustrated, is that by the famous locomotive expert Zerah Colburn, in his work on "Locomotive Engineering." It forms the basis of many similar explanations by "lesser lights" who have studied it and then paraphrased it, like the ambitious and enterprising young journalist who barged into an editorial sanctum in Fleet Street and asked for a job. When that particular Knight of the Blue Pencil asked if he could write an article on a certain subject, he said certainly he could, provided that he could have time enough to go to the nearest reference library and collect his data!! However, as the work mentioned is out of print, there is nothing to prevent an enthusiastic seeker after information on the Stephenson link-motion from borrowing Mr. Colburn's book from his local library. If they haven't got it in stock, they can obtain it under their interchange system; Croydon Library got it for Tom Glazebrook, who wanted it to copy the plate showing an old American 4-4-0 of Roger's build. I have most of it in separate unbound parts, which were a very welcome and useful gift from Mr. F. Rummens, whose beautifully-made L.N.W.R. "Sister Dora" has been illustrated in these notes. Another lucid explanation of the Stephenson gear is given in question-and-answer form, in Forney's "Catechism of the Locomotive."

A full explanation of the Walschaerts gear is given in W. W. Wood's book "The Walschaerts Locomotive Valve-Gear," also to be found in the reference department of many libraries. Mr. Wood goes into the subject very fully, and gives explanatory illustrations and diagrams. Joy valve-gear is fully explained in the fourth volume of D. K. Clark's work on "The Steam Engine." The explanation is by no less a person than old David himself, and I think we are all agreed that nobody could be more suitable! Incidentally, it is a complete K.O., as our pugilistic friends would say, for the figure-juggling fraternity, for the clever old locomotive superintendent of the "Old Worse and Worse," as the Oxford, Worcester and Wolverhampton line was usually known, shows how to set out his contrivance for any engine without using any figures at all, except to number the rods for reference. As the high-pressure cylinders of my "Jeanie Deans" have long-travel valves (the original didn't) I had to rearrange the Joy gear to suit; and Dave's notes were followed to such good purpose that one valve came out O.K. without adjustment, and the other only needed one turn of the fork.

For those whose time is limited, and cannot wade through the full details in the books mentioned above, THE MODEL ENGINEER publishing department can supply a very useful little handbook on "Locomotive Valves and Valve-Gears," by Lake and Reidinger. This gives a brief explanation, with diagrams, of most of the valve-gears in present-day use, including the Lentz, Caprotti, and other poppet-valve contrivances. Another quick dose of valve-gear medicine is to be found in "The Locomotive of To-day," which includes illustrations of actual valve-gear components. This book is useful also to beginners who are rather hazy about the various parts of a locomotive, and what are the correct names for them. Two other useful books containing information about valve-gears, are "Locomotive Engine Driving," by Driver A. Oliver, of the Southern (he knows his stuff, too!) and "Locomotive Management," by Hodgson and Williams, a *Railway Engineer* publication. I guess the above will help our friends who, like the inquisitive kiddy of the old music-hall song, are "of an enquiring turn of mind." Sorry I can't recommend a book containing the railroad Esperanto terms for the various parts of a valve-gear—especially when something goes wrong with the works!

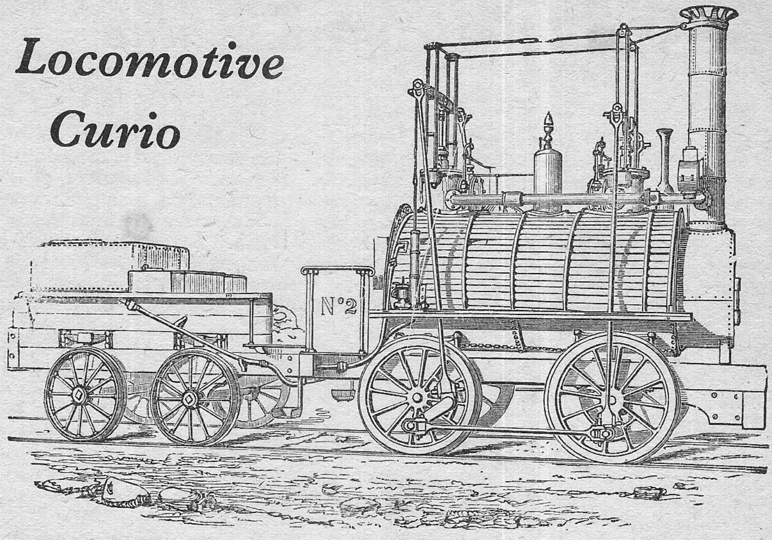
Railway Interlocking Frames

(*Continued from page* 266)

If, however, the model locking frame were built for a railway embodying pre-grouping practice the distant signal levers should be painted green, and not yellow. The lever handles and catch handles are not usually painted; they are buffed up, and kept in gleaming condition by the signalmen.

(*To be continued*)

A Locomotive Curio



THIS exceedingly interesting drawing has a little very recent history associated with it. In a letter dealing with a different matter, Mr. C. C. Evans, of North Tawton, Devon, wrote:—"While turning out a lot of old stuff, on moving, I came across the enclosed woodcut of Stephenson's locomotive . . . . . I wondered if you could use it in THE MODEL ENGINEER."

The "woodcut" was the actual wood block as received from the engraver, and was the first actual specimen that had been seen by most members of THE MODEL ENGINEER staff. Beautifully wrought in box-wood, it provided ample evidence of a craft that is all but extinct to-day.

But what of the locomotive depicted? Our guess is that it is No. 2 of the Stockton and Darlington Railway, an engine built by Stephenson's in November, 1825. But, if our guess is right, the engine is shown after considerable modification had been made to it. The wheels are certainly not the originals, while the smokebox suggests a re-building with a multi-tubular boiler. The presence and position of the whistle, to say nothing about the head-lamp, denote a period much later than 1825. Incidentally, S. & D.R. No. 2 was named *Hope*; but there is no sign of any name in the above illustration. Another point is that the style of framing shown dates from the 1830s, and we do not recall that any such framing was used by Stephenson's before 1832.

The general detail-work of the drawing seems to show that the engraver used a *photograph* as his guide; if so, then the date must be much later than 1825, and is probably somewhere about 1850.

If any reader recognises the engine or the illustration, or can throw any light whatever on this little mystery, we should be most interested to hear from him.

Fine Feed *(Continued from previous page)*

At this point, it will be well to mention that the above arrangement is advantageous only when the mandrel is being driven in single gear, i.e. coupled direct to the cone pulley. That is to say, no advantage is gained by the new feed arrangement in back-gear, since the mandrel is then revolving more slowly than the back-gear shaft. The writer's aim, however, was to obtain a really fine automatic feed, combined with a high mandrel speed, so that the above is not considered to be a great disadvantage. In any case, the normal feed train from the mandrel can be brought into operation in a few moments.

In conclusion, a table is appended for the benefit of readers who may own the same type of machine as the writer. Reference to this table will save much trial and error work in fitting in the gears. The positions of the gears on their studs are indicated as left and right; this is as one faces the machine from the front. For others it is only necessary to select the smallest four and the largest four change-wheels from their set, and to couple them up in the most convenient way.

	Left		Right	
Back-gear shaft		20		
1st Stud . .	30		50	distance piece
2nd Stud . .	55		25	
3rd Stud . .	20		65	
Mandrel . .		60		

From the above table the simplicity of the change-over from superfine to normal feed will be clear. Remove 1st stud, including gears and bracket; change 20-tooth wheel from back-gear shaft to mandrel, and the job is done.

The full-gear train as above, driving an 8 t.p.i. lead-screw, produces a fine feed of 706.4 cuts per inch, the half back-gear ratio used being 25 : 60. The finish on work done with this feed, direct from the tool, compares favourably with grinding, and has to be seen to be believed.

*A CONGREVE CLOCK

By Dr. J. BRADBURY WINTER

Details, dimensions and instructions for making an attractive timepiece

WE have discussed the main items of the mechanism, but we have left a lot of loose ends which must now be cleared up.

Wiring.—Fig. 21 is a diagrammatic chart of the connections. Starting from the source "S," which may be dry cells, accumulators, or (by far the most satisfactory) mains, the current goes to the anchorage "A" and to the bobbins, which it energises, attracting the armature. It cannot pass from "A" to "W" (the Westinghouse spark-quencher) because that device is a one-way road, or rectifier, and barred to diagrammatic anti-clockwise current. It leaves the bobbins through the anchorage "B" to the union "D" on the fibre pad on the rocking lever. Once again it was barred from passing from "B" to "W" because that would only take it back to the pole from which it started.

From "D" two wires lead to the two inner terminal inclines "EE," and for the fraction of a second while the ball bridges across from the inner to the outer, the current passes into the plate and rocking lever, escaping by one of the two screws (K) which attach the fibre pad to the lever, and so to the anchorage "C" and to the opposite pole at "S."

In my original clock there was nothing else, and when the ball broke the circuit on leaving the incline, there was a small spark which soon caused black patches and pitting on the ball, with fatally sluggish running. The Westinghouse "M3" unit entirely cures this fault. I had previously tried a condenser and resistance as supplied for wireless sets, with only partial success. The "M3" unit by-passes the bobbins. When the ball breaks the circuit, residual magnetism left in the bobbins must jump the gap between the ball and the inner incline unless another escape is offered presenting less resistance. That is what the "M3" unit does. The residual magnetism escapes from the bobbins back to "S" in a clockwise direction through "W," and presumably from the other end through "A." (Perhaps some reader will enlighten me on this last point). None of it jumps the gap, and there is no vestige of spark.

Originally I used a steel ball, but after a few weeks this gets feebly magnetised, and sluggish running results. A bronze ball, ½ in. diameter, is therefore specified, and may be expected to last indefinitely. It must be absolutely clean and free from any suspicion of grease; this applies equally to the plate. Never touch them with the fingers. The ball and plate will require dusting and wiping with a clean handerkchief about once a fortnight. The balls, when new, seem to have some kind of protective lacquer on them which makes them extremely sluggish, or they may even refuse to run at all. This can be rubbed off with methylated spirit, but even then it will be found that a new ball starts slowly and gradually gets into its stride in the course of twenty-four hours. Give it a chance!

But to return to the wiring. Insulated bell-wire (single, not twin) of a reasonably fine gauge, and not flex, is threaded through the holes in the boss of the rocking lever. Leave enough to reach an inch beyond the terminal incline; unwind the cotton to a point, say, a couple of inches short of the incline, and then cut the

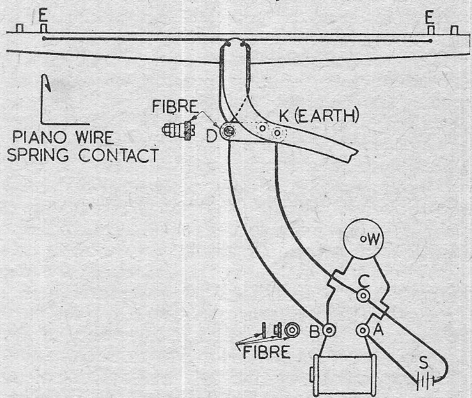


Fig. 21. Diagram of wiring

wire ½ in. short of it. Bend a bit of fine piano wire to form a springy hair-pin, to fit inside the contact hole in the incline (Fig. 21). The length of the springy part must be less than the length of the hole in the incline. The end of the spring must be bent double on itself, as shown, otherwise it might be difficult to withdraw it, it might catch up like a fish-hook at the junction of the holes in plate and incline.

When pushed into the incline, it will try to spring open and make good contact. It is bent at a right-angle when clear of the hole in the plate, and is soldered, with a good overlap, to the bell wire. The long ends of untwisted cotton are then wound on again over the joint and past the right-angle bend till safely beyond any risk of naked wire touching the plate. The ends are then tied together, and shellac or other kind of varnish is smeared all over the insulated portion.

Having got both wires arranged, enter them into the holes in the terminals while placing the "end-piece" in position, and fix it to the plate with its screws.

* *Continued from page 226, "M.E.," February 28, 1946.*

the fibre pad on rocking lever, has three washers. "K" has only one washer; it is not insulated, and its wire (black or white, not red) goes to "C" (not insulated) with two washers, one in the outer compartment for the wire from "K," and one in the middle compartment for the wire to "S" (not red).

It will be convenient to have a union (or connector) on each of the two wires for "S," hanging down a few inches below plate "B." The 6-B.A. screws for the anchorages "A," "B" and "C" should have their heads in the outer compartment, and to make them accessible to a screw-driver, three holes, say $\frac{5}{16}$ in. diameter, should be drilled in plate "A" corresponding with them. The points of the screws fixing the fibre pad to the rocking lever must not project appreciably beyond the lever, as the clearance between it and plate "A" is small.

Be sure to test the circuit, either with a volt-meter, or with a torch lamp and battery.

The Plummer Blocks

These, illustrated in Fig. 22, want making carefully, and will be an indication of the capabilities of the man who made them. Mr. Stephens and I both made ours from round gunmetal bar, but others may prefer castings from patterns. File a flat surface "A" on each part of each pair. Then file the top edge of each lower part, or base, exactly at right-angles to "A," and similarly the bottom edge of each upper part, or cap. Finish these edges by rubbing them on the file to ensure flatness.

Bolt a piece of $\frac{1}{8}$-in. sheet-brass on the face-plate, with large clearance holes, and face off a flat surface at its centre about 3 in. diameter. Take it off the face-plate, and solder the flattened edges of the two bases on it, side by side. Replace it on the face-plate and face off the bottom edges to $\frac{1}{2}$ in. from the sheet-brass. Repeat the operation for the two caps.

Drill two 2-B.A. clearance holes in the caps, $\frac{3}{4}$ in. centre to centre, and 19/64 in. from the surface "A" (a shade full to allow for finishing). Rub the edges on the file to remove burrs, and solder each cap truly flush on its base. Produce the clearance holes for, say, $\frac{1}{16}$ in., and continue with tapping size right through the bases. Tap the holes, but not right through, the studs will then screw in tight. "Steady pins" are needed to ensure a good joint. Drill two holes on a diagonal (see plan) about No. 40, starting from the base, and not going more than $\frac{1}{4}$ in. into the caps. Don't make the steady pins at present. Put in a couple of temporary screws to hold the cap on the base, and rub the surface "A" on the file for a final flattening.

With the screws in to hold it together when hot, solder the surface "A" on the sheet brass, and face off the opposite surface to a thickness of 19/32 in. (just full). Now put a centre-pop on the joint (which is sure to be visible) and half-way across the plummer block from end to end. Set it up true, with the help of my pointed bit of steel wire. With this in mind when soldering, it will be placed conveniently near the middle of the faced circle on the brass plate.

Drill and bore a $\frac{3}{8}$ in. hole right through plummer block and brass plate. Bore it out to $\frac{9}{16}$ in. diameter up to a square shoulder 1/32 in. from the brass plate, or $\frac{9}{16}$ in. from the start. That will just graze the temporary screws.

That finishes this operation for the non-lever plummer block, but for the one which covers the lever, a circular recess must be bored $\frac{3}{4}$ in. diameter, 5/32 in. broad, the start of the recess being 1/32 in. inside the outer face of the plummer block. (See Fig. 22.) "Outer" means farthest from the brass plate, it is the inner face as regards position in the clock. You will probably have to make a special tool to do this. When using it, reckon your dimensions by the micrometer on the slide-rest screw; or if there isn't one, calculate the fraction of a turn of the handle required.

Melt the plummer block off the brass plate; take out the temporary screws, and wipe off all solder from both parts of the plummer block. Wipe the brass plate, too, quite clean every time it is used. I have often advised this soldering method of chucking, I ought to have given this caution before; all old solder must be wiped off every time, otherwise there is great risk of an unseen speck of swarf throwing the work out of truth.

The steady pins can now be fitted, silver-steel wire filed to fit reasonably tightly in the bases, and eased off very slightly where they enter about $\frac{1}{8}$ in. into the caps.

Looking at the face view (Fig. 22) the dotted vertical lines show that the internal excavations bored out in the lathe are to be continued straight down to the base. Some of this metal can be removed by drilling a few holes, then finish by filing. The wall of metal left under the outside surfaces will be only 1/32 in. thick, so be careful when pinching in the vice not to crush it inwards.

File the contour according to the drawing; drill the holes for the long studs coming up from plates "A" and "D"; screw studs into the bases for the nuts holding the caps.

On the outer surface of each plummer block, a disc of mild-steel with a thin flange (1/64 in. thick) is pinched in the bore to look like the end of the trunnion. It should have a small counter-sunk hole to simulate those found at the ends of all shafts for the lathe centres. The flange is slipped inside the base before putting on the cap, and the disc can be kept pulled outwards, if found necessary, with a magnet. The disc is made a nice fit in the $\frac{3}{8}$-in. hole, so that the cap just grips it when the nuts are tightened. Similarly, for appearance, a countersunk oil-hole should be drilled on the top of the cap, but not to be used for oiling.

The plummer blocks rest on a piece of bright strip mild-steel, $\frac{1}{8}$ in. thick, between them and the wooden base. The top edge is bevelled, as shown in the drawing (Fig. 22), and a rectangular window is filed out in the centre.

The Base

The wooden base, to the under surface of which the movement is fixed, should now be made; mahogany, or oak, or whatever wood is preferred. Two edge views have already been shown in the side and front elevations (Figs. 6 and 7). A plan, viewing it from underneath

Letters

Model Electric Traction

DEAR SIR,—Now that the war is so happily over and that model engineers are free once more to devote their energies to their absorbing hobby, I should like to renew my plea made several years ago, viz., that more attention be paid by model engineers to the construction of model electric locomotives, capable of hauling passengers, and having details of construction and control comparable with full-sized equipment.

It gives me considerable surprise and disappointment to realise that while model steam locomotives built and equipped substantially as full-sized machines (allowing for the fact that "you can't scale Nature") must exist in thousands the number of comparable electric locomotives of which I am aware can be counted on the fingers of one hand!

I think that there are a number of reasons for the deplorable lack of interest in this virtually untrodden field of model engineering. Firstly, a steam locomotive is a vastly more impressive sight and fires the public imagination to a much greater extent than does an electric locomotive. Secondly, there are only a small number of electric locomotive prototypes at present in this country; but this lack will probably be remedied in the none too distant future. Thirdly, there is the "steam outline" model. There is, in some quarters, a distinct tendency to disparage this type of model as something trivial and unworthy of serious attention; consequently, when electric locomotives are mentioned the "toy-shop" idea comes uppermost in many minds. The fact that this type of model is regarded by some as so blatantly incorrect has had the effect of creating a feeling that all electric locomotives should be stigmatised as something unworthy of the close study of model engineers.

In the fourth place, there is a good deal of misunderstanding about electric traction motors and equipments. For example, in THE MODEL ENGINEER for March 5th, 1903, p. 231, Mr. A. R. M. Simkins, an electrical engineer, writing about model electric locomotives, said that "...it requires a 20-gauge wire to carry an ampere of current, so that to talk of axle-hung motors and 500 volts is simply absurd."

Well, of course, no sane person nowadays would wish to use 500 volts to operate a passenger-hauling model; but, on the other hand, traction motor windings are run at a very much higher current-density than 1,000 amps. per sq. in., which is the current-density implied by Mr. Simkin's remark. Again, Mr. H. Greenly, in his book "Model Electric Locomotives and Railways," on pages 264/5, states:—"In models all the apparatus is of a more or less delicate nature, and the refinements of real electric traction can hardly be applied." Here Mr. Greenly is obviously referring to the smaller gauges, but statements like the above coming from sources regarded as authoritative have, I think, given rise to the feeling that model electric traction is virtually impossible, and, therefore, not even worth attempting.

In the fifth place, the power supply for a passenger-hauling model electric locomotive has hitherto been a bit of a problem, but thanks to the car-starter battery and the trickle-charger, this difficulty is largely obviated. Finally, even in these days many people are quite afraid of electricity, and whereas red sparks from a steam locomotive chimney are quite in order—even though they could be quite a serious fire-risk—blue sparks from the collector-shoes of an electric locomotive are a source of much alarm!

Summing up, my contention is this:—If it is possible to make—subject to the proviso that "you can't scale Nature"—model steam passenger-hauling locomotives, constructed and operating like full-sized machines, why should it not be equally possible to make model electric locomotives equally true to full-sized practice but, subject of course, to the above important proviso? I, for one, cannot possibly see why this cannot be done.

Yours faithfully,
Bognor. F. L. GILL-KNIGHT.

Cine Projector Design

DEAR SIR,—I feel that I must make some reply to "Excogitate's" letter (see THE MODEL ENGINEER, dated January 3rd), in which he "assures" readers that the theories expressed in my article on shutter design do not work out in practice. The fact that the maligned three-bladed shutter served the silent film for two or three decades is something in its favour, and as I have used it a number of times in the various projectors I have built during the last twenty years or so, the "theories" have some practical experience to back them.

A possible cause of poor results is in over-illumination of the screen, a common fault today when substandard projectors appear to sell on the strength of the wattage of the projection lamp they employ. Too much screen brilliance can "burn out" detail in the high-lights; it must be controlled and varied according to the size of picture projected. There is a definite standard suitable for normal prints and correctly exposed reversal film and at this standard, satisfactory results are obtainable at 16 frames per second with a three-bladed shutter. That is my own experience.

Yours faithfully,
Leeds. G. A. GAULD.

Showmen's Steam Plant

DEAR SIR,—I was very interested in the article by Mr. Gentry, which dealt with and illustrated an uncommon showman's steam plant, I have seen this machine two or three times when I lived in Surrey, and the peculiar action of the engine always interested me. Like Mr. Gentry, I have never been a passenger in one of the cars, or are they swings? I notice that another machine is also mentioned, viz.: the steam driven roundabouts, with horses fitted with leaping motion, driven, of course, by overhead crankshafts. The majority of these machines seem to be built by Messrs. Savage, of King's Lynn, but I would like to mention here that I have seen at least one other make. I had an opportunity of looking at the engine at close

The Society of Model and Experimental Engineers

The "Brains Trust" will function at the next meeting, to be held at 39, Victoria Street, Westminster, S.W.1, on Saturday, March 16th, at 2.30 p.m. Will all members with any technical questions they desire answered please submit them first to the secretary. These questions will be considered by the questionmaster, but the "Brains" will not have prior notice of the questions they will have to answer.

Members will appreciate that the success of this meeting will depend upon the number and diversity of the questions submitted, and they are asked to help by sending in some interesting queries.

Full particulars of the society may be obtained from the Secretary: J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

Oxford and District Model Engineering Society

An inaugural meeting will be held at 7.30 p.m., on Friday, March 15th, 1946, in the Halifax Buildings (by the courtesy of Mr. J. H. Brookes, M.A., Principal, Schools of Technology, Art and Commerce).

Will all interested in this new Oxford venture please make every effort to attend, as there is important business to discuss.

Glasgow Society of Model Engineers

The next meeting will be held within the Society Rooms, on Saturday, March 16th, 1946, at 7.30 p.m. The evening will be devoted to 5-in. gauge locomotives, several examples of which are expected to be forward, irrespective of their state of progress. In view of the rapid developments at the new track site, special interest attaches to "motive power" likely to be available.

Parts of locomotives in progress will be welcome and all interested in the subject, whatever the gauge, should bring examples of their work.

Work on the railway site has restarted for the season, with James McKechnie as master of works. Under his direction good progress should be possible, while all help given will be gladly received by the section convenors.

Visitors will be welcomed, and particulars of membership can be had from the address below.

Secretary: JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

Cardiff and District Society of Model and Experimental Engineers

At our February 20th meeting, a presidential address was to have been given by Mr. Edward Jones, the City Electrical Engineer for Cardiff, whom we have been fortunate enough to secure as our new president, but owing to illness, he was unable to attend.

Instead, an interesting impromptu talk was given by a club member, Mr. Rupert Davies, on his initial attempt at building a hydroplane, followed by the secretary's reading of a paper by Mr. Nethercott, of Swindon, on "My Ideal Boat."

The centre of interest at the moment is the building of the track which is to consist of a continuous run in 2½-in. and 3½-in. gauge, mounted on permanent concrete pillars, and is situated at 58, Clive Road, Canton, Cardiff. Those interested are cordially invited to inspect on Saturday afternoons or Sunday mornings, after 9.30 a.m. Meetings held 1st and 3rd Wednesdays in the month.

The next meeting will be held on March 20th.

Hon. Secretary: F. B. ANGWIN, 47, Rommilly Crescent, Cardiff.

The Junior Institution of Engineers

Friday, March 15th, at 6.30 p.m., 39, Victoria Street, S.W.1. Ordinary meeting. "The Internal Combustion Turbine for Aircraft Jet Propulsion," by S./Ldr. R. M. Cracknell, R.A.F., M.B.E., A.M.I.Mech.E. (member).

Sheffield Section. Friday, March 15th, at 7.0 p.m., Metallurgical Club, West Street, Sheffield. Ordinary meeting. "Electrical Fire Risks," by W. Fordham Cooper, B.Sc., A.K.C., M.I.E.E., A.M.I.Mech.E. (member).

Friday, March 22nd, at 6.30 p.m., 39, Victoria Street, S.W.1. Informal meeting. "Chalk Houses," by B. H. Nixon. Slides.

Western Group of Members: Friday, March 22nd, at 7.30 p.m. By kind permission of the directors, the meeting will be held in the staff canteen of Messrs. Stothert and Pitt Ltd., Bath. "Gearing, and Modern Gear Cutting Practice," by L. Morgan.

Friday, March 29th, at 6.30 p.m., 39, Victoria Street, S.W.1. Informal meeting. "Salvage," by Commander K. W. Willans, R.N. (retired), M.I.Mech.E. (member).

Friday, April 12th, at 6.30 p.m., 39, Victoria Street, S.W.1. Ordinary meeting. "Some Precision Measuring Machines," by N. J. Bowyer-Lowe (member).

Sale Model and Engineering Club

The Brains Trust held on Monday, February 18th, was well attended, and there was a variety of questions put to the team dealing in model and general engineering subjects. The question of encouraging youths in model engineering was raised, and it was decided to admit junior members between the ages of 14 and 18 years to the club. On attaining the age of eighteen, the junior member would then become a full member and become eligible to vote at the annual general meeting. It was thought that the junior section would appeal to youths who had had their interests whetted through building model planes, etc., in the A.T.C. and other youth movements, and the headmaster of a local school had mentioned that at his school repeated requests had been made for information *re* model making, etc.

Hon. Secretary: Mr. J. GRIFFITHS, 95, Northenden Road, Sale.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co. Ltd., Cordwallis Works, Maidenhead, Berks.

All correspondence relating to advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," Cordwallis Works, Maidenhead, Berks.

THE "MODEL ENGINEER" SALES AND WANTS

Private: **Threepence** *word*. *Trade*: **Sixpence** *word*. *Use of Box* **2/6** *extra*. *Minimum charge*, **3/-**

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road' London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Silver Steel Rounds, Squares, Asbestos Sheet, String, B.M. Steel Rounds, Squares, Angles, Flats, Brass Rounds, Squares, Flats, Hexagons, Sheets, Copper Tubes, Rounds, Squares, Sheets, Screws, Nuts, Drills, Taps, Dies, Rivets. S.A.E. for lists.—S. REED & SON, 89, Keresley Road, Coventry.

Copper Tube for Boilers, $\frac{3}{8}$", $\frac{1}{2}$", $\frac{3}{4}$", 2", $2\frac{1}{2}$", 3", $3\frac{1}{2}$", $4\frac{1}{2}$", and 6" 20-g. to 14-g. $\frac{1}{4}$" square copper rod, round copper rod all sizes, steel angles, $\frac{1}{2}$", $\frac{3}{4}$" and 1"; bright steel for frames, 1/16th, 3/32", and $\frac{1}{8}$" thick, 2" to 4" in width. Unlimited quantities of the above cut to your length. 5 c.c. aero engine castings and blue prints, 25s. per set. 10 c.c. aero engine castings and blue prints, 35s. per set. All supplies for the model engineer.—BROADWAY (BRISTOL) ENGINEERING CO., Wellington Hill West, Bristol 9.

Split Chucks for Watchmakers Lathes, 6 mm., $6\frac{1}{2}$ mm., and 8 mm., at 6s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

"Tool News" keeps you up-to-date. Specimen copy 6d., post free.—GARNERS, Sheffield Road, Barnsley.

Self Centring Chucks, Burnerd 4", price £4 17s. 6d.; Crown, 4", £3 12s. 6d.; Independent $4\frac{1}{2}$" Burnerd, 50s.; 6", £3 17s. 6d.; Crown, 6" Independent, £3 2s. 0d.; Backplate Castings, 4s. 6d.; High Speed Lathe Tools, $\frac{1}{4}$", 5/16", and $\frac{3}{8}$" sq., 20s. set of eight; Copper Tube, $\frac{1}{8}$" to 7" diameter. Cash or C.O.D.—CORBETT'S (LATHES), Stanton Hill, Mansfield. Telephone 583 Sutton-in-Ashfield.

Sensitive Bench Drill, $\frac{1}{2}$" capacity, 2 speed, adjustable table, £6; 1/3 h.p. B.T.H. Motor, 240 volts, nearly new, £5; Grinding Head, 5" wheels, £1 5s. Fridays after 7.0 p.m.—59, Deancroft Road, Eastcote, Pinner.

Wanted, 4" or 5" Woodworking Lathe, complete with motor, or just lathe.—T. SLASSOR, 40, Searle Street, Cambridge.

Wanted, First class 3" 3-jaw S.C. Chuck, dial indicator, vernier height gauge, f 2.8 3" camera lens.—TREHERNE, c/o TRE, Malvern, Worcester.

For Sale, Collet Motion and Collets, etc., suitable for 5" Southbend lathe, £7; ditto suitable for Atlas lathe, both little used. Also 5/16" Herbert Automatic Die Head and Chasers, £3.—The Lawns, Ascot.

Wanted, Four Sheets Brass, $6\frac{1}{2}$ × $6\frac{1}{2}$ × 1/16, flat.—E. S. BRADBURNE, Alison, Buxton, Derbyshire.

For Sale, 5 sets H.S. No. Drills, 1-70, 43s. per set with stands, new; small quantity H.S. Reamers and End-mills, $\frac{1}{8}$"-1/16", 3s. to 6s. 9d. each, new; one 1/3 h.p. 3 phase 440 v. Motor, nearly new, £5.—T. W. SMITH, Ratcliffe Culey, Atherstone, Warwickshire.

What Offers? Brown & Sharpe's 6" Vernier Caliper, Dial Test Indicator, No. 625, Planer & Shaper Gauge, 12" and 20" Steel Straightedges, Combination Bevel, Starrett's Vernier Depth Gauge, Micrometer 1"-2" by thousandths. All new. Full particulars.—PRICE, 53, Roderick Road, Hampstead, London.

Wanted, 8 and 6 mm. Watchmakers' Lathe Collets.—139, Hamlin Lane, Exeter.

Wanted, Small Power Shaper, Planer, Lathe, Milling Cutters, Miller, $\frac{1}{4}$ to $\frac{1}{2}$ h.p. A.C. Motors, and other useful workshop equipment. Wanted, at reasonable prices. What have you got?—W., 80, Ridgeview Road, London, N.20.

Wheeler Milling and Gearcutting Attachment, £9 10s.; 4" combination chuck, self-centring independent, 50s.; rack-and-star-wheel action for Southbend poppet barrel, 45s.—110, Manor Way, Mitcham, Surrey.—Pollards 5848.

Wanted, Die, nine mm. diameter × 1.0 mm. pitch. Consider set metric fine threads. Write—BM/MBW, London, W.C.1.

Littlefield, Marlborough College, Wilts., 1939-45 War Memorial Workshop. The following equipment is sought: 4" Wood Turning, and $3\frac{1}{2}$-4" Screwcutting all-purpose Lathes, Pillar Drill (cap. $\frac{1}{2}$"), Tool Grinders, all powered by independent motors D.C. $\frac{1}{2}$ h.p.; Hand Shaper, 6"-10", Benches and Vices for metal and woodwork. Gifts of the above, or information where they may be obtained at low cost, will be welcomed by the Hon. Secretary, Lt.-Col. A. E. TITLEY.

Wanted, Set of Change Wheels for 3" Lathe, 20 to 100 in 5s. Particulars to—GOLDSPINK, Ightham, Kent.

7/16" Bench Type Pillar Drill, £4 10s.; 9/16" British Supreme ditto, £6 15s.; $\frac{1}{2}$" ditto with Motor Platform, £6; $\frac{1}{2}$" Holbrook Bench Drills with Motor Platform, £5; various Floor Mounting Drilling Machines; No. $1\frac{1}{2}$ Square Slide Flypresses, £4; No. 2 ditto, £4 10s.; No. $2\frac{1}{2}$ ditto, £5 5s.; No. 3 ditto, £6; No. $1\frac{1}{2}$ Vee Slide Flypresses, £6; No. 2 ditto, £6 15s.; No. $2\frac{1}{2}$ ditto, £7 10s.; No. 3 ditto, £9; all presses reconditioned and supplied with handle and ball weights; Power Hacksaw Machines, belt driven and motorised; various Polishing Heads, cheap. All carriage paid.—H. KNAPTON (MACHINE TOOLS) LTD., Friston Street, Birmingham.

Wanted, 3" to $3\frac{1}{2}$" Lathe. Treadle or power. Please send details to—JESSUP, 1, Heathwood Gardens, Swanley, Kent.

Lathe Reconditioned. We invite enquiries for repairs and overhauls to all types of Machines, hand scaping to fine limits.—THORNTON & SHEARD, Engineers and Oxy-Acetylene Welders, Bunkers Hill, Golcar, Huddersfield.

Wanted, Small Jig Saw, or Band Saw, or Fretsaw Machine, motorised for lighting power.—GLOVER, 2, Norwood Avenue, Lowton St. Mary's, Nr. Warrington.

Three Speed Foot Motor, suit 3" lathe, new, £2 15s.; Myford $3\frac{3}{8}$" Chip Tray, £1; Myford Vertical Slide, swivelling, new, £2 10s.; 3" and 4" Bell Chucks, screwed $\frac{3}{4}$ Whit., 5s. each; 4 cylinder Magneto, £1. Carriage extra.—PARSONS, 1822, Bristol Roads, Rednal, Birmingham.

Wanted, 3" to 4" B.G.S.C. Lathe with chucks. Give particulars, price, where seen to—G., 79, London Road, Wembley, Middlesex.

Wanted, Myford Bench Lathe, $3\frac{1}{2}$" or $3\frac{1}{8}$" motorised, must be good working order.—SHERIDAN, 50, Manor Drive, Esher. Tel., Emberbrook 1596.

Wanted, Lathe, 3" to 4" S.C. or Adept Super. Write—"Woodcote," Highlands Road, Fareham, Hants.

For Sale, $4\frac{1}{4}$" B.G.S.C. Lathe, slide rest fitted with 4-way tool post, 25/32" hole through mandrel, 3-jaw Chuck, back plates, etc., complete with chip tray. Very sturdy machine. Price £35.—WARD, 119, Roehampton Vale, S.W.15. Put. 6167.

Flextol Power Driven Flexible Tool, fitted 415 volts A.C. Motor, with sanding and drilling tools, excellent condition, £80 or near offer.—HENRY & FARTHING LTD., 33-37, Bell Street, London, N.W.1.

Wanted, $3\frac{1}{2}$" to $4\frac{1}{2}$" Centres B.G.S.C. Lathe.—G.F., The Green, Calne, Wilts.

Colchester 6" Lathe, S.C., Taper Turning attachment, Denbigh Milling Machine, small Pedestal Milling Machine, various small tools, chucks and electric motors to 3 h.p., single phase.—WATKINS SERVICE GARAGE, High Street, Banstead, Burgh Heath 1414.

ELECTRICAL EQUIPMENT

Electradix Bargains include:

Dynamo and Motor Generator Bargains. G.E.C. double current Dynamos, 6 volts, 5 amps., 600 volts, 80 m.a., ball-bearings, 17 lb., as new, 37s. 6d., carriage paid, 5s. refunded on returned packing case.—Below.

Small D.C./D.C. Motor Generators by leading makers for use in Radio Receivers to take the place of H.T. battery, 6 volts input, 10 volts, 15 m.a. output, or 12 volts input, 230 volts, 30 m.a. output, £3 15s., weight only $5\frac{1}{2}$ lb., size $5\frac{1}{2}$" × $3\frac{1}{2}$" × $3\frac{1}{2}$", model finish, ball-bearings, 2-comms., 2 separate windings, waterproofed.—Below.

Transformers, 3 K.W. Crypto, 230 volts to 115 volts, 28 amps., £9 10s., to small Bell Transformers, 230/3/58 volts, 7s. 6d. Transformers for Rewind, 3 K.W. with stampings $4\frac{1}{2}$" × 6" × $7\frac{1}{2}$", windings damaged by blitz, weight with damaged wire, 65 lb., 45s., carriage extra.—ELECTRADIX, 214, Queenstown Road, London, S.W.8.

A.C. Motors, 1/50th h.p. to 10 h.p., from stock; also D.C.—JOHNSON ENGINEERING, 86, Great Portland Street, London, W.1. Museum 6373.

Brand New A.C. Motors, 200/250 volts, high starting torque, $\frac{1}{4}$ h.p., £5; 1/3 h.p., £5 10s. All sizes available.—JOHN STEEL, Bingley, Yorks.

Charging Dynamo, 150 watt, excellent condition, £6 10s. Photograph, stamp.—C. SMITH, 22, Quantock Road, Weston-super-Mare.

Stuart Turner No. 10 Pump, 230 volt D.C., unused, £4 10s.; ditto, 230 volt A.C., used, but in good order, £3 10s.—LOWE, 91, Nantwich Road, Crewe.

MODELS & FITTINGS

Complete Set of locomotive and tender super high class quality wheel castings required for 2" scale G.N. Ivett Atlantic locomotive.—Woodside, Beechpark Avenue, Northenden, Manchester.

Apex and New Atom Minor (Mr. Westbury's design). Engine castings in our latest attractive finish now ready. Carburettor castings (described June 14th issue MODEL ENGINEER), and spiral timing gears for Apex, ball-races, piston rings, miniature plugs, contacts and other requirements. Send us your enquiries. Trade also invited.—THE HEADINGLEY MOTOR & ENGINEERING CO. LTD., 8, Otley Road, Leeds.

Australian Models. Australian Locomotive and Engine Designs, also Castings. Catalogue, 2s.—BOLTON, 70, King Street, Sydney.

David Curwen, Experimental Engineers, Gore Lane, Bardon, Nr. Marlborough, Wilts. Light power steam engines of all types.

Majesco "45" Miniature Aero-Motor (4.5 c.c.), die castings; all materials; detailed instructions; working drawings. Complete kit, 36s. (post paid).—MAJESCO MINIATURE MOTORS, 35, St. Flora's Road, Littlehampton, Sussex.

Model Car Tyres, 4" × $\frac{7}{8}$", solid rubber, professionally made, few only, 2s. 6d. each.—JONES, Haw Park Farm, Wotton-under-Edge, Glos.

3½" and 5" Gauge Castings, Hornblocks, Wheels, etc., L.N.E. Pacific, P. V. Baker Wheels and Cylinders. Special treated frame steel. Drawings for L.N.E. A3 Pacific, 3½" gauge. Enquiries, S.A.E.—V. BYRNE, 2, Church Street, Middlesbrough.

Wanted, Good 3½", 5" or 7¼" gauge Locomotive, Track, Passenger Trucks. Also good Gas or Hot-air Engine.—Box No. 3914, MODEL ENGINEER Offices.

2½" Coal-fired Passenger Hauler, L.B.S.C., new, perfect, £40. S.A.E. for specification.—Box No. 3915, MODEL ENGINEER Offices.

Hallam Nipper, Coil, etc., complete. Engine needs attention, 55s. Letters only.—N. CONWAY, 8, Anandale Street, Edinburgh 7.

Harthop 1¼ H.P. Engine, £12. Buyer collects. Particulars answered.—G. SELF, 39, Church Road, Guildford.

What Offers? 30" Model Racing Yacht, new, automatic steering. Two "Golden Hind" Galleons, 22" long; MODEL ENGINEERS, Oct., 1926, to Oct. 1940. Full particulars.—PRICE, 53, Roderick Road, Hampstead, London.

"Lumec" 9.5 Projector, detailed drawings, 9s. 6d., gearing and optics can be supplied, particulars 4d.—RACET DESIGNS, 46, Orchard Way, Walton Road, Chesterfield.

Bassett-Lowke "O" Gauge Electric Railway, 6-8 v., 180 p. Scale Track, Points, 3 Locomotives, 1 Rail Car, Coaches, Trucks, Stations, Control Panels, etc., £100.—Box No. 3925, MODEL ENGINEER Offices.

Wanted, Model Petrol Engine, 10 c.c. complete. Good condition.—WYLDE, 20, Garendon Gardens, Morden, Surrey.

Wanted, 5" gauge Locomotive, good workmanship and performance essential, full particulars to—Box No. 3926, MODEL ENGINEER Offices.

For Sale, Vertical Steam Engine, 1½" bore × 2½" stroke, and boiler, working order, needs slight attention. Also small Steeple Engine, 1" bore × 2" stroke, approx., no flywheel, £12 10s. the two.—9, Hall Bank, Buxton, Derbys.

Wanted, Model Steam Engines and Locomotives. Send offers with full particulars to—J. A. CUTHBERTSON, Biggar, Scotland.

American G.H.Q. Petrol Engine, 16 c.c., propeller, flywheel, coil, etc. Bought 1940, £9 10s.—155, Chipstead Valley Road, Coulsdon, Surrey.

Boiler Building and Brazing Service. Quotation gladly given against drawing. All work tested and guaranteed. Cylinders and wheels machined, light turning to order, all at reasonable prices. Easyflow and Silbralloy in stock. Stamped addressed envelope for list.—WEMBLEY MODELS, 6, Park Road, Wembley.

Building "Hielan Lassie?" Materials from—MAXTED, Central, Chatham Street, Ramsgate.

Two 6 c.c. Engines, Crankshaft Rotary Valve, 4,500 r.p.m., 13" prop., guaranteed perfect. Only run once, £4 10s. each.—21, Albert Road, Albrighton, Near Wolverhampton.

20 Ft. Speedboat, Ford V8 engine, very fast, demonstration on Clyde. Will exchange for warship (preferred) ship model, etc.—CHURCHILL, Crossways, Helensburgh, Telephone 222.

3½" Gauge "Princess Royal" Locomotive. Tender completed, chassis 60 per cent. complete. Precision workmanship. Castings and drawings to complete job, £45, or exchange good 3½" or 4" lathe and accessories.—Box No. 3927, MODEL ENGINEER Offices.

3/16" Globe Valve, 10s. 6d.; 3/16" Check Valve, 6s. 6d.; 3/16" Plain Water Gauge, 7s.—THOMAS McCRACKEN, 388, Main Street, Rutherglen.

Wanted, 2½" gauge Steam Locomotive Chassis with cylinders.—HEBDON, North End, Crofton Lane, Orpington.

Wanted, Part finished boiler for ¾" scale "Lord Nelson." Must be a first class job on approval. For sale, pair ⅞" bore Locomotive Cylinders, finished, £1 each; pair ½" bore, 15s. each; Prints for 2½" Pacific Bonds, 2½" "Flying Scotsman," Lowke, 10s. 6d. each; 3 pair Driving Wheels, turned axles and boxes fitted, 20s.; Smokebox Ring and Door, 6s.; Smokebox Saddle, 2s. 6d.; 12 Gunmetal Splashers, 9d. each; 6 Brass Buffer Beams, 2s. 6d. each; Dome, 1s. 6d.; Chimney, 1s.; 2 G. Metal Con.-Rods, 1s. 6d. each; 4 pair Rods, 9d. each; pair Steel Plates, cut out and drilled for Scotsman, and 2 distance pieces, and 9 supports for same, 15s.; pair 6 wheel Tender Plates, cut out with bearings, springs, and wheels fitted with axles, 35s.; 18 Brass Dummy Springs, 6d. each; 34 Horn Blocks, 3d. each; 9 Axle Boxes, 4½d. each; 6 Driving Wheel Castings, 5⅝", 4s. each; 6 Wheel Castings, 3¾", 2s. 6d. each; 9 Wheel Castings, 2½", 9d. each; 4 Wheel Castings, 1¾", 8d. each; pair Cylinder Castings, covers and valve parts will bore to 1 1/16" × 2" long, 12s. 6d. Carriage paid over 10s.—KENDALL, 106, Rugby Road, Binley, Coventry.

Can Anyone Spray-Paint, line and letter 3½" L.N.E.R. Pacific locomotive and tender correctly and well, supplying paints? If so, please write—OSCAR SEYD, 174, Kings Road, Westcliff-on-Sea, Essex.

Fifteen Sets of High Speed Twin Cylinder, all enclosed steam cylinder castings in best qualtty cylinder iron, bronze connecting-rods, complete with drawings, 15s. per set.—WEBB, 189, Streetsbrook Road, Shirley, Warwickshire.

GENERAL

Watch and Clock Making. If interested you can get all tools and parts also wheels cut from—JOHN MORRIS, 64, Clerkenwell Road, E.C.1. Regret no posts or lists, only counter service at present.

Watchmakers Demobbed need Lathes to start work again. John Morris (Clerkenwell) Ltd., will pay high prices for Lathes by Lorch, Boley, Wolf Jahn, and American and Swiss makes.—64, Clerkenwell Road, E.C.1. CLE 6077.

Toys, Models and Novelties. Book of designs with instructions. 50 illustrations. Popular number, 2s. 6d., post free.—HARROD (M), 10, Beaconsfield Road, Maidstone.

Blueprints. The best working drawings, locomotives, rolling stock, and permanent way, true to prototype Send 2½d. for list, stating gauge.—HENRY GREENLY, 66, Heston Road, Heston, Middlesex.

Metal Moulds for Lead Toys. Deep cut, supplied in over 200 latest designs. Satisfaction guaranteed. S.A.E. for lists.—AGASEE, 7, Stradbroke Road, London, N.5.

Conjuring Tricks. List of Magical Effects, 3d.—DE HEMPSEY, Entertainer, 363, Sandycombe Road, Kew Gardens, Surrey.

To Ship Modellers. Collaboration of experienced Model Makers is sought. Plans and materials supplied free in return for a report on the accuracy of the plans. Please write—MODELCRAFT LTD., 77, Grosvenor Road, London, S.W.1, giving credentials and preferred class of model.

Best Offer for copies of MODEL ENGINEERS, Sept. 17th, 1942, to Dec. 28th, 1944 (three missing); also all for 1945.—COOKE, 269, St. Margarets Road, Twickenham.

Skilled photographic instrument repairers required, used to up-to-date shutter mechanisms, permanency for the right men. Apply—BAXTER, 171, Victoria Street, London, S.W.1. 'Phone Victoria 0802.

Wanted, in Good Condition, complete set of issue of MODEL ENGINEER covering construction of "L.B.S.C." "Petrolea."—HALL, 23, Irwin Avenue, Heworth, York.

"Model Engineers," clean, 1943-1945; Locomotive, Engineering Books. Reasonable offers. Details S.A.E.—178, Tayor Hill Road, Huddersfield.

143 "Model Engineers," Sept., 1943, to Dec., 1945, 4 missing; 21 "Practical Mechanics," April, 1944, to Dec., 1945, inclusive; 40 "Practical Engineering," odd copies, 1942-1945; 13 "English Mechanics," 1935. Reasonable offer. Machine Cut, 120.T. Master or Slave Clock Impulse Wheels, milled teeth, 2¼" dia., ¼" bore × 1/16" 6 ⅜" True Holes for Lightness; 15 or 20.T. Master Ratchet Wheels, 1½" dia. × 1/16" fitted bush, 3/32 hole; 4 ¼ holes for lightness, undercut teeth. Clean finish. Ready for assembling, 3s. each, 3 for 7s. 6d., post paid.—E. MEDHURST, 43, Eland Road, W. Croydon, Surrey.

Marine Engineer, 31, B.O.T. first-class steam certificate, keen model engineer, public school, ex-P.o.W., released M.N., seeks responsible position ashore. Plant maintenance, power station work, etc. Comprehensive experience steam plants, works machinery. Excellent references. Knowledge German, Afrikaans. Go anywhere U.K., Europe, South Africa, Australia, New Zealand. Available immediately.—Box No. 3928 MODEL ENGINEER Offices.

Sale, Exchange, MODEL ENGINEERS, 1940, '41, '42, '43, '44. Wanted 5-pint Brazing Lamp.—70, Newton Street, Gorton, Manchester 18.

Finchley Engineers have small quantities of high grade Lathe and Bench work for outwork. Enquiries invited. State facilities.—NEWTON & WRIGHT, 68, Ballards Lane, N.3.

The Engineers Drafting Service, 7A, Canons Corner, Edgware, Middlesex. Your ideas, etc., designed or developed. Production drawings prepared by Experts.

Wanted, "Mechanics," Dec. 2/39, to March 26/40, or volume No. 28, complete.—Box No. 3916, MODEL ENGINEER Offices.

Wanted, Clean copy of MODEL ENGINEER. Series "Windmills and Wind Motors."—Box No. 3924, MODEL ENGINEER Offices.

Wanted, The MODEL ENGINEER from the commencement up to 1942. Preferably bound. Must be in good condition.—GLEDHILL, Scoresby Street, Bradford, Yorks.

To Museums and Collectors. Unique opportunity. Three R.N. Lifeboat Instn. presentation models, 1866-1897, mint condition, all gear, silver inscription plates, original glass cases, £80, £30 singly.—Captain VICKERMAN, Llangurig.

Wanted, Vol. 86 to 91 MODEL ENGINEER. State price. — F. Park, 453, Whalley Road, Clayton Le Moors, Nr. Accrington, Lancashire.

Tool Turning, Experimental and Lathe capacity available for high class work. Enquiries invited.—"PUNTER'S PERFECTIONS," Sea Meads, Smithies Avenue, Sully, Glam.

130 "Model Engineers," 1943 to date, few missing; 35 "Mechanics," £2 lot.—ARNOULD, 27, Nutfield Road, Coulsdon.

Pittler Owners. Wanted to buy or hire George Adams' "Pittler Book and Pittler Combined Catalogue and Workshop Practice," also MODEL ENGINEERS, May 16th, and Dec. 12th, 1940; also wanted 5" Pittler accessories.—G. O. RHYS, Waverley, Lammas Street, Carmarthen.

For Sale, 98 odd copies MODEL ENGINEER, 1942/44; also gauge "O" B.-L. Steam Mogul. Offers.—CLARKE, 2, Whitelaw Road, Millbrook, Southampton.

Printed in Great Britain for the Proprietors by ELECTRICAL PRESS, LTD., Cordwallis Works, Maidenhead, Berks., and published by PERCIVAL MARSHALL & CO., LTD., Cordwallis Works, Maidenhead, Berks.